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Roll No._____ to be filled in by the candidate.

Inter. (Part-II)-A- 2015

(For all sessions)

Paper Code	8	1	9	1

Mathematics (Objective Type)

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. Who recongnized the term function to describe the dependence of one quantity on other?

(A) Euler (B) Leibniz (C) Langrange (D) Bohr

2. If $f(x)=x^2$, then domain of f is:

(A) real No (B) integer (C) rational No (D) irrational

3. $\lim_{x\to a}\frac{f(x)-f(a)}{x-a}$ is equal to:

(A) $f'(x)$ (B) $f'(a)$ (C) $f'(2)$ (D) $f'(0)$

4. If $f(x)=x^{\frac{2}{3}}$, then $f'(8)$ is equal to:

(A) $\frac{1}{2}$ (B) $\frac{2}{3}$ (C) $\frac{1}{3}$ (D) 3

5. The derivative of $\sqrt{x}$ at $x=a$ is:

(A) $\frac{1}{2\sqrt{a}}$ (B) $2\sqrt{a}$ (C) $\frac{1}{\sqrt{a}}$ (D) $\frac{-1}{2\sqrt{a}}$

6. $\frac{d}{dx}(\sec x)$ is equal to:

(A) $\sec x \tan x$ (B) $-\sec x \tan x$ (C) $\sec^2 x$ (D) $\cos ec^2 x$

7. $\frac{1}{1+x^2}$ is derivative of:

(A) $\sin^{-1} x$ (B) $\sec^{-1} x$ (C) $\tan^{-1} x$ (D) $\cot^{-1} x$

8. $\int x^n dx =$ for $n\neq -1$.

(A) $\frac{x^{n+1}}{n}+c$ (B) $\frac{x^{n-1}}{n-1}+c$ (C) $\frac{x^{n+1}}{n+1}+c$ (D) $n\,x^{n-1}+c$

9. $\int \ell nx\,dx$ is equal to:

(A) $x\ell nx-x$ (B) $x-x\ell nx$ (C) $x\ell nx+x$ (D) $\frac{1}{x}\ell nx$

10. $\int x\left(\sqrt{x}+1\right)dx$ is equal to:

(A) $\frac{2}{3}x^{3/2}+c$ (B) $\frac{2}{5}x^{5/2}+\frac{x^2}{2}+c$ (C) $\frac{2}{5}x^{5/2}+c$ (D) $x^{3/2}+x+c$

11. $\int a^x\,dx$ is equal to:

(A) $\frac{a^x}{\ell na}+c$ (B) $\frac{\ell na}{a^x}+c$ (C) $\frac{1}{a^x\ell na}$ (D) $a^x\ell na+c$

12. $\int_1^2\left(x^2+1\right)dx$ is equal to:

(A) $\frac{3}{10}$ (B) 2 (C) $\frac{10}{3}$ (D) 0

13. $\int_{-\pi}^{\pi}\sin x dx$ is equal to:

(A) 1 (B) 0 (C) 2 (D) -1

14. Bisectors of angles of a triangle are:

(A) parallel (B) perpendicular (C) concurrent (D) non-concurrent

15. If $b=0$, then the line $ax+by+c=0$ is parallel to:

(A) $y-axis$ (B) $x-axis$ (C) along $x-axis$ (D) None of these

16. A function which is to be maximized or minimized is called:

(A) subjective function (B) qualitative function (C) objective function (D) quantitative function

17. Comics are the curves obtained by cutting a right circular cone by.

(A) a line (B) a plane (C) sphere (D) two lines

18. The parabola $y^2=4ax$, $a>0$ opens

(A) right (B) left (C) upward (D) downward

19. The unit vector of a vector $\underline{v}$ is:

(A) $\frac{\underline{v}}{|\underline{v}|}$ (B) $\underline{v}|\underline{v}|$ (C) $\frac{|\underline{v}|}{\sqrt{|\underline{v}|}}$ (D) $\frac{\underline{v}}{|\underline{v}|^2}$

20. The angle between the vectors $2\hat{i}+3\hat{j}+\hat{k}$ and $2\hat{i}-\hat{j}-\hat{k}$ is:

(A) 30^0 (B) 45^0 (C) 60^0 (D) 90^0

Roll No._____ to be filled in by the candidate.	(For all sessions)	Subject code	6	0	1	9

Mathematics (Essay Type)

Time: 2:30 Hours **Marks: 80**

Section -I

2x25=50

2. Write short answers of any eight parts from the following. **2x8=16**

i. Prove the identity $\cos ec\, h^2 x = \cot h^2 x - 1$.

ii. Evaluate the limit: $\lim_{x\to\infty}\left(1+\frac{3}{x}\right)^{2x}$.

iii. Differentiate $x^{-3}+2x^{\frac{-3}{2}}+3$ w.r.t x.

iv. Find $\frac{dy}{dx}$ If $x^2+y^2=a^2$.

v. Differentiate $y=e^{f(x)}$ w.r.t x.

vi. Find $\frac{dy}{dx}$ If $y=\cos^{-1}x$.

vii. Find $\frac{dy}{dx}$ If $x=y\sin y$.

viii. Find $\frac{dy}{dx}$ If $y=x\sqrt{\ell nx}$.

ix. Find $f'(x)$ If $f(x)=e^{\sqrt{x}-1}$.

x. Differentiate $\sin h^{-1}\left(\frac{x}{2}\right)$ w.r.t x.

xi. Write Maclaurins series expension of the function $f(x)$.

xii. Determine the intervals in which $f(x)=4-x^2, x\in(-2,2)$ increases or decreases.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Use differential find $\frac{dy}{dx}$ for $x^2+2y^2=16$.

ii. Evaluate: $\int(x+1)(x-3)dx$.

iii. Find: $\int(\ell nx)\times\frac{1}{x}dx$. $(x>0)$

iv. Evaluate: $\int\sec x\, dx$.

v. Evaluate: $\int(\ell nx)^2\, dx$

vi. Find $\int\frac{x+2}{\sqrt{x+3}}dx$.

vii. Evaluate: $\int\frac{2a}{x^2-a^2}dx$. $(x>a)$

viii. Evaluate: $\int_1^2\frac{x}{x^2+2}dx$.

ix. Find area bounded by the curve $y=4-x^2$ and $x-axis$.

x. Solve D.E $\sin y\ \cos ec\ x\frac{dy}{dx}=1$.

xi. Graph the solution set of $5x-4y\le 20$.

xii. Define convex region.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Define $y-$intercept of a line.

ii. Find the slope and inclination of the line joining points $A(-2,4), B(5,11)$.

iii. Find the equation of the line bisecting first and third quadrants.

iv. Find the points of intersection of lines $x+4y-12=0$ and $x-3y+3=0$.

v. Find the lines represented by $9x^2+24xy+16y^2=0$.

vi. Find the centre and radius of circle $x^2+y^2+12x-10y=0$.

vii. Find focus and vertex of parabola $x^2=-16y$.

viii. Find the centre and foci of ellipse $25x^2+9y^2=225$.

ix. Find the centre and foci of hyperbola $\frac{y^2}{16}-\frac{x^2}{9}=1$.

x. Find the unit vector in the direction of $\vec{v}=2\hat{i}-\hat{j}$.

xi. Find α so that $\left|\alpha\hat{i}+(\alpha+1)\hat{j}+2\hat{k}\right|=3$.

xii. Find the scaler $\propto$ so that the vectors $2\hat{i}+\alpha\hat{j}+5\hat{k}$ and $3\hat{i}+\hat{j}+\alpha\hat{k}$ are perpendicular.

xiii. Find the value of α so that $\alpha\hat{i}+\hat{j}$, $\hat{i}+\hat{j}+3\hat{k}$ and $2\hat{i}+\hat{j}-2\hat{k}$ are coplaner.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) If $f(x)=\frac{2x+1}{x-1}$, then find $f^{-1}(x)$ and verify that $\left(f\,0\,f^{-1}\right)x=x$.

(b) Find $f'(x)$, when $f(x)=(\ell nx)^{\ell nx}$.

6. (a) Show that $\int e^{ax}\sin bx\,dx=\frac{1}{\sqrt{a^2+b^2}}e^{ax}\sin\left(bx-\tan^{-1}\frac{b}{a}\right)+c$.

(b) Find a joint equation of the straight line through the origin and perpendicular to the lines represented by $x^2+xy-6y^2=0$.

7. (a) Evaluate: $\int_1^3\frac{x^2-2}{x+1}dx$.

(b) Maximize $f(x,y)=2x+5y$ subject to the constraints $2y-x\le 8$; $x-y\le 4$; $x\ge 0$, $y\ge 0$.

8. (a) Find the length of the chord cut off from the line $2x+3y=13$ by the circle $x^2+y^2=26$.

(b) Find the angle between the vectors $\bar{u}=2i-j+k$ and $\bar{v}=-i+j$.

9. (a) Write an equation of parabola with focus (1 , 2) and vertex (3 , 2).

(b) Prove vectorially $\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta$.

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Inter. (Part-II)-A- 2016

(For all sessions)

Paper Code	8	1	9	7

Mathematics (Objective Type)

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. $\frac{1}{2}\frac{d}{dx}\left[\tan^{-1}x-\cot^{-1}x\right]=$

(A) $\frac{1}{1+x^2}$ (B) $\frac{1}{1+x^2}$ (C) $\frac{1}{1-x^2}$ (D) $\frac{-1}{1-x^2}$

2. If $f(x)=\tan^{-1}x$ then $f'(\cot x)=$

(A) $\cos^2 x$ (B) $\sin^2 x$ (C) $\operatorname{cosec}^2 x$ (D) $\cot^2 x$

3. $\frac{d}{dx}\left[\frac{1}{\sin x}\right]=$

(A) $\frac{1}{\cos x}$ (B) $-\frac{\sin x}{\cos x}$ (C) $\operatorname{cosec}^2 x$ (D) $-\operatorname{cosec} x\cot x$

4. $\frac{d}{dx}\left(\ell n e^x\right)=$

(A) e^x (B) 1 (C) x (D) $\frac{1}{x}$

5. $\int_{-\infty}^{\infty}\frac{1}{1+x^2}dx=$

(A) π (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{2}$

6. $\int_0^{\pi/2} k\cos x\,dx=4$, then $k=$

(A) 5 (B) 4 (C) 2 (D) 0

7. If $g(x)=\frac{1}{x^2}(x\neq 0)$ then $gog(x)$ is equal to:

(A) 1 (B) x^2 (C) x^4 (D) $\frac{1}{x^4}$

8. The function $f(x)=\frac{2+3x}{2x}$ is not continuous at:

(A) $x=-3$ (B) $x=-\frac{2}{3}$ (C) $x=0$ (D) $x=1$

9. $\frac{1}{x}\frac{d}{dx}\left(\sin x^2\right)=$

(A) $2x\cos x^2$ (B) $\cos x^2$ (C) $2x\cos^2 x$ (D) $2\cos x^2$

10. Slope of line is 1(one) and angle made by line with $x-axis =$.

(A) 45^0 (B) 30^0 (C) 60^0 (D) 75^0

11. The solution set of $x<4 =$

(A) $0<x<4$ (B) $10<x<15$ (C) $-\infty<x<4$ (D) $4<x<\infty$

12. Mid-poit of line segment joining foci of ellips is called its =

(A) centre (B) vertex (C) directrix (D) major-axis

13. A circle touches the two axis at (a , 0) and (0 , a) then centre of circle is =

(A) (- a , a) (B) (a , -a) (C) (a , a) (D) (- a , - a)

14. What is the value of $[\underline{a}\ \underline{b}\ \underline{b}] =$

(A) 1 (B) -1 (C) 0 (D) 2

15. Which of triples can be direction angles of a single vector = :

(A) $90^0, 90^0, 45^0$ (B) $0^0, 0^0, 45^0$ (C) $45^0, 45^0, 90^0$ (D) $30^0, 30^0, 30^0$

16. $\int\frac{\sin 2x}{\sin x}dx =$

(A) $\sin 2x$ (B) $2\sin 2x$ (C) $\frac{1}{2}\sin x$ (D) $2\sin x$

17. $\int\frac{\ell ogx}{x}dx =$

(A) ℓogx (B) $log(\ell ogx)$ (C) $\frac{(\ell ogx)^2}{2}$ (D) $\frac{1}{x}$

18. $\int\tan\frac{\pi}{4}dx =$

(A) $\ell n\left(\sin\frac{\pi}{4}\right)$ (B) 1 (C) $\sec^2\frac{\pi}{4}$ (D) $x\tan\frac{\pi}{4}$

19. $\int\frac{\sin p}{\cos^2 x}dx =$

(A) $\sin p\sec^2 x$ (B) $\sin p\tan x$ (C) $\cos p\sec^2 x$ (D) $\sec^2 x$

20. Centroid is a point which divides each median in ratio =

(A) 2 : 1 (B) 1 : 2 (C) 1 : 1 (D) 3 : 2

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Mathematics (Essay Type)

Time: 2:30 Hours

Marks: 80

Section -I

2x25=50

2. Write short answers of any eight parts from the following. **2x8=16**

i. Prove that $\cos h^2 x - \sin h^2 x = 1$

ii. Evaluate: $\lim_{x \to \pi} \frac{\sin x}{\pi - x}$.

iii. Evaluate: $\lim_{x \to 2} \frac{\sqrt{x} - \sqrt{2}}{x-2}$.

iv. Find $\frac{dy}{dx}$ by 1st principle $\sqrt{x+2}$.

v. Differentiate w.r.t x $\frac{a+x}{a-x}$.

vi. Differentiate $x^2 - \frac{1}{x^2}$ w.r.t x^4.

vii. Differentiate w.r.t x $\frac{1}{a}\sin^{-1}\frac{a}{x}$.

viii. Find $\frac{dy}{dx}$ if $y = \frac{x}{\ell n x}$.

ix. Find y_2 if $y = \sqrt{x} + \frac{1}{\sqrt{x}}$.

x. Expand a^x by maclaurin's series.

xi. Define critical point.

xii. Find the interval for which function is increasing and decreasing $f(x) = 4 - x^2$ for $x \in (-2, 2)$.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate: $\int x\sqrt{x^2 - 1}\, dx$.

ii. Evaluate: $\int \frac{\sqrt{y}(y+1)}{y} dy \qquad y > 0$.

iii. Evaluate: $\int \frac{\cot\sqrt{x}}{\sqrt{x}} dx \qquad x > 0$.

iv. Find $\int x \cos x\, dx$

v. Evaluate: $\int e^x \left(\frac{1}{x} + \ell n x\right) dx$.

vi. Define definite integral. Give one example.

vii. Evaluate: $\int_0^{\pi/2} \cos^2\theta \sin\theta\, d\theta$.

viii. Solve the differential equation $\frac{dy}{dx} = \frac{y^2+1}{e^{-x}}$.

ix. Find the area above the $x-axis$ and the curve $y = 5 - x^2$ from $x = -1$ to $x = 2$.

x. Find δy and dy of the function defined as $f(x) = x^2$ when $x = 2$ and $dx = 0.01$.

xi. Define vertex of the solution region.

xii. Graph the solution set of the inequality $3x + 7y \geq 21$.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Find h such that A (-1 , h) , B (3 , 2) and C (7 , 3) are collinear.

ii. If (x, y) co-ordinates of a point are $(-2, 6)$. Find (x, y) transformed co-ordinates if new origin is $o'(-3, 2)$.

iii. Three points A (7 , -1) , B (-2 , 2) and C (1 , 4) are consecutive vertices of a parallelogram. Find the fourth vertex.

iv. Find the point of intersection of lines $x + 4y - 12 = 0$ and $x - 3y + 3 = 0$

v. Find acute angle between the lines represented by $x^2-xy-6y^2=0$.

vi. Show that the line $3x-2y=0$ is tangent to the circle $x^2+y^2+6x-4y=0$.

vii. Find the equation of tangent drawn from (0 , 5) to circle $x^2+y^2=16$.

viii. Find focus and vertex of parabola $y=6x^2-1$.

ix. Find an equation of ellipse whose vertices are $(0,\pm5)$ and ecentricity $3/5$.

x. Find x so that $|xi+(x+1)j+2k|=3$.

xi. Find unit vector perpendicular to $\vec{a}=2i-6j-3k$, $\vec{b}=4i+3j-k$

xii. Constant force $\vec{F}=4i+3j+5k$ moves an object from (3 , 1 , -2) to (2 , 4 , 6).Find the work done.

xiii. Find a vector of magnitude > parallel to $2i+3j+2k$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Evaluate: $\lim_{x\to0}\frac{1-\cos 2x}{x^2}$.

(b) If $y=a\cos(\ell nx)+b\sin(\ell nx)$ then prove that $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+y=0$.

6. (a) Evaluate: $\int\frac{5x+8}{(x+3)(2x-1)}dx$.

(b) Find h such that the points $A(\sqrt{3},-1)$, $B(0,2)$, $C(h,-2)$ are the vertices of a right triangle with right angle at the vertex A.

7. (a) Find the area between the X-axis and the curve $y=\sqrt{2ax-x^2}$ when $a>0$.

(b) Find the maximum value of $f(x)=4x+6y$ under the constraints

$2x-3y\le6$, $2x+y\ge2$, $2x+3y\le12$, $x\ge0$, $y\ge0$

8. (a) Find equation of the tangents to the circle $x^2+y^2=2$ parallel to the line $x-2y+1=0$.

(b) Find the number Z, so that the triangle with vertices A(1, -1 , 0) , B(-2,2,1) and C(0,2, Z) is a right angle triangle with right angle at C.

9. (a) Find an equation of the parabola whose focus is F (-3,4) and directrix is $3x-4y+5=0$.

(b) Find the value of α so that $\alpha\underline{i}+\underline{j}$, $\underline{i}+\underline{j}+3\underline{k}$ and $2\underline{i}+\underline{j}-2\underline{k}$ are coplaner.

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Marks: 80

Section -I

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iii. Evaluate: $\lim_{x \to 2} \frac{\sqrt{x} - \sqrt{2}}{x - 2}$.

iv. Find $\frac{dy}{dx}$ by 1st principle $\sqrt{x+2}$.

v. Differentiate w.r.t x $\frac{a+x}{a-x}$.

vi. Differentiate $x^2 - \frac{1}{x^2}$ w.r.t x^4.

vii. Differentiate w.r.t x $\frac{1}{a}\sin^{-1}\frac{a}{x}$.

viii. Find $\frac{dy}{dx}$ if $y = \frac{x}{\ell n x}$.

ix. Find y_2 if $y = \sqrt{x} + \frac{1}{\sqrt{x}}$.

x. Expand a^x by maclaurin's series.

xi. Define critical point.

xii. Find the interval for which function is increasing and decreasing $f(x) = 4 - x^2$ for $x \in (-2, 2)$.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate: $\int x\sqrt{x^2 - 1}\, dx$.

ii. Evaluate: $\int \frac{\sqrt{y}(y+1)}{y} dy \qquad y > 0$.

iii. Evaluate: $\int \frac{\cot\sqrt{x}}{\sqrt{x}} dx \qquad x > 0$.

iv. Find $\int x \cos x\, dx$.

v. Evaluate: $\int e^x \left(\frac{1}{x} + \ell n x\right) dx$.

vi. Define definite integral. Give one example.

vii. Evaluate: $\int_0^{\pi/2} \cos^2\theta \sin\theta\, d\theta$.

viii. Solve the differential equation $\frac{dy}{dx} = \frac{y^2 + 1}{e^{-x}}$.

ix. Find the area above the $x-axis$ and the curve $y = 5 - x^2$ from $x = -1$ to $x = 2$.

x. Find δy and dy of the function defined as $f(x) = x^2$ when $x = 2$ and $dx = 0.01$.

xi. Define vertex of the solution region.

xii. Graph the solution set of the inequality $3x + 7y \geq 21$.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Find h such that A (-1 , h) , B (3 , 2) and C (7 , 3) are collinear.

ii. If (x, y) co-ordinates of a point are $(-2, 6)$. Find (x, y) transformed co-ordinates if new origin is $o'(-3, 2)$.

iii. Three points A (7 , -1) , B (-2 , 2) and C (1 , 4) are consecutive vertices of a parallelogram. Find the fourth vertex.

iv. Find the point of intersection of lines $x + 4y - 12 = 0$ and $x - 3y + 3 = 0$

v. Find acute angle between the lines represented by $x^2 - xy - 6y^2 = 0$.

vi. Show that the line $3x - 2y = 0$ is tangent to the circle $x^2 + y^2 + 6x - 4y = 0$.

vii. Find the equation of tangent drawn from (0 , 5) to circle $x^2 + y^2 = 16$.

viii. Find focus and vertex of parabola $y = 6x^2 - 1$.

ix. Find an equation of ellipse whose vertices are $(0, \pm 5)$ and ecentricity $3/5$.

x. Find x so that $|xi + (x+1)j + 2k| = 3$.

xi. Find unit vector perpendicular to $\vec{a} = 2i - 6j - 3k$, $\vec{b} = 4i + 3j - k$

xii. Constant force $\vec{F} = 4i + 3j + 5k$ moves an object from (3 , 1 , -2) to (2 , 4 , 6).Find the work done.

xiii. Find a vector of magnitude > parallel to $2i + 3j + 2k$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Evaluate: $\lim_{x \to 0} \frac{1 - \cos 2x}{x^2}$.

(b) If $y = a\cos(\ell nx) + b\sin(\ell nx)$ then prove that $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$.

6. (a) Evaluate: $\int \frac{5x+8}{(x+3)(2x-1)} dx$.

(b) Find h such that the points $A(\sqrt{3}, -1)$, $B(0,2)$, $C(h, -2)$ are the vertices of a right triangle with right angle at the vertex A.

7. (a) Find the area between the X-axis and the curve $y = \sqrt{2ax - x^2}$ when $a > 0$.

(b) Find the maximum value of $f(x) = 4x + 6y$ under the constraints

$2x - 3y \leq 6$, $2x + y \geq 2$, $2x + 3y \leq 12$, $x \geq 0$, $y \geq 0$

8. (a) Find equation of the tangents to the circle $x^2 + y^2 = 2$ parallel to the line $x - 2y + 1 = 0$.

(b) Find the number Z, so that the triangle with vertices A(1, -1 , 0) , B(-2,2,1) and C(0,2, Z) is a right angle triangle with right angle at C.

9. (a) Find an equation of the parabola whose focus is F (-3,4) and directrix is $3x - 4y + 5 = 0$.

(b) Find the value of α so that $\alpha\underline{i} + \underline{j}$, $\underline{i} + \underline{j} + 3\underline{k}$ and $2\underline{i} + \underline{j} - 2\underline{k}$ are coplaner.

2-I ☆

Inter. (Part-II)-A- 2017

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(For all sessions)

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Mathematics (Objective Type)

Group-I

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1-1. If $f(x)$ is continuous at point $x=a$, then.

(A) $f(a)=\lim_{x\to a} f(x)$ (B) $f(a)=\lim_{x\to 0} f(x)$ (C) $f(0)=\lim_{x\to a} f(x)$ (D) $f(x)=\lim_{x\to a} f(x)$

2. $\lim_{x\to 0}\frac{\sin bx}{\sin ax}$ is equal to:

(A) $-a/b$ (B) $-b/a$ (C) a/b (D) b/a

3. $\frac{d}{dx}(\cos^{-1}x)$ is equal to:

(A) $\frac{1}{\sqrt{1-x^2}}$ (B) $\frac{-1}{\sqrt{1-x^2}}$ (C) $\frac{1}{1+x^2}$ (D) $\frac{-1}{1+x^2}$

4. $\frac{d}{dx}(\sec hx)$ is equal to:

(A) $\sec x\tan x$ (B) $-\sec x\tan x$ (C) $-\sec hx\tanh x$ (D) $\sec hx\tanh x$

5. Let $y=\cos(ax+b)$, then y_2 equals.

(A) ay (B) $-ay$ (C) a^2y (D) $-a^2y$

6. The critical value of $f(x)=x^2-x-2$ equals.

(A) $\frac{1}{2}$ (B) $\frac{-1}{2}$ (C) 2 (D) -2

7. If $y=\sin^{-1}\sqrt{x}$, then $\frac{dy}{dx}$ equals.

(A) $\frac{1}{2\sqrt{x}\sqrt{1-x^2}}$ (B) $\frac{-1}{2\sqrt{x}\sqrt{1-x^2}}$ (C) $\frac{1}{2\sqrt{x}\sqrt{1-x}}$ (D) $\frac{1}{\sqrt{x}\sqrt{1-x}}$

8. $\int\frac{f'(x)}{f(x)}dx$ equals.

(A) $\ell n\, f'(x)$ (B) $\ell n\, f(x)$ (C) $f(x)$ (D) $f'(x)$

9. $\int\cot x\,dx$ is equal to:

(A) $\ell n\sin x$ (B) $\ell n\cos x$ (C) $-\ell n\sin x$ (D) $-\ell n\cos x$

10. $\int \tan^2 x\,dx$ is equal to:

(A) $2\tan x$ (B) $2\tan x + x$ (C) $\tan x + x$ (D) $\tan x - x$

11. $\int e^{ax}\left[af(x)+f'(x)\right]dx$ is equal to:

(A) $e^{ax}f'(x)$ (B) $e^{ax}f(x)$ (C) $e^{ax}.a\,f'(x)$ (D) $e^{ax}.a\,f(x)$

12. $\int_0^1 (3-x)\,dx$ equals:

(A) $3/2$ (B) $2/3$ (C) $5/2$ (D) $2/5$

13. Inclination of line joining two points (-2 , 4) and (5 , 11) equals:

(A) $\pi/3$ (B) $\pi/4$ (C) $\pi/6$ (D) $\pi/2$

14. Two lines represented by $ax^2+2hxy+by^2=0$ will be perpendicular if:

(A) $h^2+ab=0$ (B) $h^2-ab=0$ (C) $a-b=0$ (D) $a+b=0$

15. Perpendicular distance of point P(6,-1) from line $3x+4y+1=0$ equals:

(A) 1 (B) 2 (C) 3 (D) 4

16. (0 , 0) lies in the solution set of inequality.

(A) $x+2y\leq 10$ (B) $x+2y\geq 10$ (C) $x+2y\geq 1$ (D) $x-2y\geq 10$

17. The co-ordinates of vertices of hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ equals:

(A) $(0,\pm b)$ (B) $(\pm b,0)$ (C) $(0,\pm a)$ (D) $(\pm a,0)$

18. The co-ordinates of centre of circle $x^2+y^2-6x+4y+13=0$ is equal to:

(A) (-3 , 2) (B) (3 , -2) (C) (3 , 2) (D) (-3 , -2)

19. Vector triple product of three non zero vectors $\underline{a},\underline{b}$ and $\underline{c}$ is denoted by:

(A) $\underline{a}\times(\underline{b}\times\underline{c})$ (B) $\underline{a}.(\underline{b}\times\underline{c})$ (C) $\underline{a}.(\underline{b}+\underline{c})$ (D) $\underline{a}.(\underline{b}-\underline{c})$

20. $\left[2\ \underline{k}\ \underline{j}\ \underline{i}\right]$ is equal to:

(A) 1 (B) -1 (C) -2 (D) 2

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Roll No._____ to be filled in by the candidate. **(For all sessions)**

Mathematics (Essay Type) Group-I

Time: 2:30 Hours **Marks: 80**

Section -I

2x25=50

2. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate: $\lim_{x\to 2}\frac{\sqrt{x}-\sqrt{2}}{x-2}$.

ii. Differentiate $\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)^2$ w.r.t x.

iii. Find $\frac{dy}{dx}$,when $y=\sqrt{x+\sqrt{x}}$.

iv. Differentiate $x^2\sec 4x$ w.r.t x.

v. Find $\frac{dy}{dx}$,if $x=y\sin y$.

vi. Find $f'(x)$ if $f(x)=x^2\ell n\sqrt{x}$.

vii. Find y_2 if $y=\cos^3 x$.

viii. Find $\frac{dy}{dx}$ if $y=xe^{\sin x}$.

ix. Apply maclaurin's series expansion to prove that $e^x=1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+\ldots\ldots$.

x. Discuss continuity of function $f(x)\begin{cases}2x+5 & if\ x\le 2\\ 4x+1 & if\ x>2\end{cases}$ at $x=2$.

xi. Determine the function $f(x)=x^3+x$ as an even or odd function.

xii. Determine the intervals in which $f(x)=\cos x : x\in\left(-\pi/2, \pi/2\right)$ is increasing or decreasing function.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate: $\int\frac{e^{2x}+e^x}{e^x}dx$.

ii. Evaluate: $\int\cos 3x\sin 2x\,dx$.

iii. Evaluate: $\int\frac{x+b}{(x^2+2bx+c)^{1/2}}dx$.

iv. Evaluate: $\int e^{-x}(\cos x-\sin x)dx$.

v. Evaluate: $\int_0^3\frac{1}{x^2+9}dx$.

vi. Evaluate: $\int_2^{\sqrt{5}} x\sqrt{x^2-1}\,dx$.

vii. What is the linear programming?

viii. Solve the differentional equation $\frac{1}{x}\frac{dy}{dx}=\frac{(1+y^2)}{2}$.

ix. Using differentional, find $\frac{dy}{dx}$ in the equation $x^2+2y^2=16$.

x. Using differentional to find the value of $\sqrt[4]{17}$.

xi. Find the area bounded by $\cos x$ function from $x=\frac{-\pi}{2}$ to $x=\frac{\pi}{2}$.

xii. Graph the solution set of the linear inequality $x+y\ge 5$ by shading.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Find co-ordinates of the point that divides the join of A(-6,3) and B(5,-2) in the ratio 2:3.

ii. Find the slope and inclination of the line joining the points (4,6) and (4,8).

iii. Convert $2x-4y+11=0$ in normal form.

iv. Find an equation of the line through the point (2,-9) and intersection of the lines $2x+5y-8=0, 3x-$

v. Find whether the point (5,8) lies above or below the line $2x-3y+6=0$.

vi. Find the centre and radius of the circle $5x^2+5y^2+14x+12y-10=0$.

vii. Determine whether the point P(-5,6) lies outside, on, or inside the circle $x^2+y^2+4x-6y-12=0$.

viii. Find focus and vertex of parabola $y^2=-8(x-3)$.

ix. Find foci and eccentricity of the ellipse $25x^2+9y^2=225$.

x. Find direction cosines of the vector $\underline{r}=x\underline{i}+y\underline{j}+z\underline{k}$.

xi. Find a vector of length 5, in the direction opposite to the vector $\underline{v}=\underline{i}-2\underline{j}+3\underline{k}$.

xii. If $\underline{a}+\underline{b}+\underline{c}=0$, then prove that $\underline{a}\times\underline{b}=\underline{b}\times\underline{c}=\underline{c}\times\underline{a}$.

xiii. Find the value of α, so that the vectors $\alpha\underline{i}+\underline{j}$, $\underline{i}+\underline{j}+3\underline{k}$ and $2\underline{i}+\underline{j}-2\underline{k}$ are coplaner.

Section -II

Note: Attempt any three questions from the following. 10x3=

5. (a) Evaluate: $\lim\limits_{\theta\to 0}\dfrac{\tan\theta-\sin\theta}{\sin^3\theta}$.

(b) If $x=\sin\theta$, $y=\sin(m\theta)$ then prove that $(1-x^2)y_2-xy_1+m^2y=0$.

6. (a) Evaluate: $\int\dfrac{\sqrt{2}}{\sin x+\cos x}dx$.

(b) Find equations of two parallel lines perpendicular to $2x-y+3=0$ such that the product of the $x-$ and $y-$ intercepts of each is 3.

7. (a) Evaluate: $\int_{-1}^{1}|x-3|dx$.

(b) Minimize $z=3x+y$ subject to the constraints $3x+5y\geq 15$, $x+6y\geq 9$, $x\geq 0$, $y\geq 0$.

8. (a) Show that the lines $3x-2y=0$ and $2x+3y-13=0$ are tangent to the circle $x^2+y^2+6x-4y=0$.

(b) Prove that, by vector method $\cos(\alpha-\beta)=\cos\alpha\cos\beta+\sin\alpha\sin\beta$.

9. (a) Find centre, foci and vertices of the hyperbola $\dfrac{(x-1)^2}{2}-\dfrac{(y-1)^2}{9}=1$

(b) Find volume of the tetrahedron whose vertices are A(2,1,8), B(3,2,9), C(2,1,4) and D(3,3,0).

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Inter. (Part-II)-A- 2017

Roll No._____ to be filled in by the candidate.

(For all sessions)

Paper Code	8	1	9	2

Mathematics (Objective Type)

Group-II

Time: 30 Minutes

Marks: 20

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. tan hx is equal to:

(A) $\frac{e^{-x}+e^{x}}{e^{x}-e^{-x}}$ (B) $\frac{e^{x}-e^{-x}}{e^{x}+e^{-x}}$ (C) $\frac{e^{-x}-e^{x}}{e^{x}+e^{-x}}$ (D) $\frac{e^{-x}+e^{x}}{2}$

2. $\lim_{x\to 0}\frac{x}{\tan x}$ is equal to:

(A) 0 (B) 1 (C) ∞ (D) $\frac{1}{2}$

3. $\lim_{x\to\infty}\left(1+\frac{1}{n}\right)^{\frac{n}{2}}$ is equal to:

(A) e (B) $\sqrt{e}$ (C) 0 (D) $\frac{1}{e}$

4. $\frac{d}{dx}\left(x^3+4\right)^{\frac{1}{3}}$ is equal to:

(A) $x\left(x^3+4\right)^{\frac{-3}{2}}$ (B) $\left(x^3+4\right)^{\frac{-2}{3}}2x^2$ (C) $x^2\left(x^3+4\right)^{\frac{-2}{3}}$ (D) $\left(x^3+4\right)^{\frac{4}{3}}$

5. If $f(x)=\frac{2}{x^3}$ then $f'(2)$ is equal to:

(A) $\frac{3}{8}$ (B) $\frac{5}{8}$ (C) $\frac{1}{4}$ (D) $\frac{-3}{8}$

6. $\frac{d}{dx}fog(x)=$

(A) $f'\left[g(x)\right]g'(x)$ (B) $f\left[g(x)\right]g'(x)$ (C) $f'\left[g'(x)\right]$ (D) $f'(x).g'(x)$

7. $\frac{d}{dx}a^{\lambda x}=$

(A) $\lambda a^{\lambda x}\ell na$ (B) $a^{\lambda x}\ell na$ (C) $\frac{a^{\lambda x}}{\ell na}$ (D) $\frac{a^{\lambda x}}{\lambda}$

8. $\int \ell nx\ dx=$

(A) $x-x\ell nx+c$ (B) $x\ell nx+x+c$ (C) $\frac{1}{x}+c$ (D) $x\ell nx-x+c$

9. $\int \sin 2x\ dx=$

(A) $\frac{-\cos 2x}{2}$ (B) $\frac{\cos 2x}{2}$ (C) $2\cos 2x$ (D) $-2\cos 2x$

10. $\int \frac{1}{x^2+9} dx =$

(A) $\frac{1}{3}\sin^{-1}\frac{x}{3}$ (B) $\frac{1}{3}\tan^{-1}\frac{x}{3}$ (C) $\frac{1}{3}\cos^{-1}\frac{x}{3}$ (D) $\tan^{-1}\frac{x}{3}$

11. $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \cos x \, dx =$

(A) 0 (B) 1 (C) 2 (D) -2

12. $ydx + xdy = 0$

(A) $\frac{x}{y} = c$ (B) $\frac{y}{x} = c$ (C) $xy = c$ (D) $x + y = c$

13. If $ax^2 + 2hxy + by^2 = 0$ is homogeneous equation then pair of lines are real and coincident if:

(A) $h^2 - ab > 0$ (B) $h^2 - ab < 0$ (C) $h^2 - ab = 0$ (D) $h + a + b = 0$

14. Two lines having slope m_1 and m_2 are perpendicular if:

(A) $m_1 = -m_2$ (B) $1 + m_1 m_2 = 0$ (C) $m_1 m_2 = 1$ (D) $m_1 m_2 = 0$

15. The point (3,-8) lies in the quadrant.

(A) I (B) II (C) III (D) IV

16. If $x = -3$ satisfies.

(A) $x + 3 > 2$ (B) $x + 3 > -2$ (C) $3x > 0$ (D) $x + 2 > 5$

17. If $x^2 + y^2 + 2gx + 2fy + c = 0$ represents equation of circle then radius $r =$.

(A) $\sqrt{g^2 + f^2 + c}$ (B) $\sqrt{g^2 - f^2 - c}$ (C) $\sqrt{g^2 - f^2 + c}$ (D) $\sqrt{g^2 + f^2 - c}$

18. If e is eccentricity then conic represents ellipse.

(A) $e = 0$ (B) $e = 1$ (C) $e < 1$ (D) $e < 0$

19. If $\vec{v} = -\sqrt{3}/2\, i - \frac{1}{2} j$, then $\left|\vec{v}\right| =$

(A) 1 (B) 0 (C) $\frac{1}{2}$ (D) 4

20. The value of $i.j \times k =$

(A) 0 (B) -1 (C) j (D) 1

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Roll No._____ to be filled in by the candidate. **(For all sessions)**

Mathematics (Essay Type) Group-II

Time: 2:30 Hours **Marks: 80**

Section -I

2x25=50

2. Write short answers of any eight parts from the following. **2x8=16**

i. Write down domain and range of $y=\sec x$.

ii. Evaluate: $\lim_{h\to 0}(1+2h)^{\frac{1}{h}}$.

iii. Evaluate: $\lim_{x\to 2}\frac{\sqrt{x}-\sqrt{2}}{x-2}$.

iv. If $y=\frac{1}{x^2}$, then find $\frac{dy}{dx}$ at $x=-1$.

v. Differentiate $\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)^2$.

vi. Differentiate $x^2.\sec 4x$.

vii. Differentiate $\sin x$ w.r.t $\cot x$.

viii. Find $\frac{dy}{dx}$ If $y=\sqrt{x+\sqrt{x}}$.

ix. Find $\frac{dy}{dx}$ If $y=\sinh^{-1}(x^3)$.

x. Find $f'(x)$ If $f(x)=\ell n\left(\sqrt{e^{2x}+e^{-2x}}\right)$.

xi. Find $\frac{dy}{dx}$ If $xy+y^2=2$.

xii. Find y_2 If $y=x^2e^x$.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate: $\int\frac{1}{1+\cos x}dx$.

ii. Using differential, find $\frac{dx}{dy}$ if $xy-\ell nx=c$.

iii. Evaluate: $\int\frac{\left(1-\sqrt{x}\right)^2}{\sqrt{x}}dx$, $(x>0)$.

iv. Evaluate: $\int\sec x dx$.

v. Evaluate: $\int\frac{\sec^2 x}{\sqrt{\tan x}}dx$.

vi. Evaluate: $\int e^{2x}(-\sin x+2\cos x)dx$.

vii. Evaluate: $\int_1^2\frac{x}{x^2+2}dx$.

viii. Evaluate: $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}}\cos t\,dt$.

ix. Solve the differential equation $\frac{dy}{dx}=\frac{1-x}{y}$.

x. Solve the differential equation $\sin y\cos ecx\frac{dy}{dx}=1$

xi. What is an optimal solution?

xii. Graph the solution region of linear inequalities $x+y\le 5$, $y-2x\le 2$.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Find the co-ordinates of point that divide the join of A(-6,3) and B(5,-2) in 2:3.

ii. The two points P(3,2) , O'(1,3) are in $xy-$coordinates. Find P in $xy-$coordinate system.

iii. Write the equation of line in two intercept form.

iv. Find the equation of line passing through A(-6,5) having slope 7.

v. Find the slope of the line $2x+y-3=0$.

vi. Find the radius of the circle $x^2+y^2+12x-10y=0$.

ii. Find the centre and radius of the circle $x^2+y^2=5$.

iii. Write the standard equation of Hyperbola.

x. Find the focus and the directrix of parabola $y^2=-12x$.

x. Find a vector whose magnitude is 4 and is parallel to $2\vec{i}-3\vec{j}+6\vec{k}$.

xi. Find α so that $\left|\alpha\vec{i}+(\alpha+1)\vec{j}+2\vec{k}\right|=3$.

xii. Find $\vec{b}\times\vec{a}$, where $\vec{a}=3\vec{i}-2\vec{j}+\vec{k}$, $\vec{b}=\vec{i}+\vec{j}$.

xiii. find the value of $3\vec{j}.\vec{k}\times\vec{i}$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Find the : $\lim\limits_{x\to 0}\dfrac{1-\cos px}{1-\cos qx}$.

(b) If $y=\sqrt{\tan x+\sqrt{\tan x+\sqrt{\tan x+.....\infty}}}$ then prove that $(2y-1)\dfrac{dy}{dx}=\sec^2 x$.

6. (a) Evaluate: $\int\tan^4 x\,dx$.

(b) Find equations of two parallel lines perpendicular to $2x-y+3=0$ such that the product of the $x-$intercept and $y-$intercept of each is 3.

7. (a) Evaluate: $\int_0^{\frac{\pi}{4}}\dfrac{\cos\theta+\sin\theta}{2\cos^2\theta}\,d\theta$.

(b) Graph feasible region and find corner points of $2x+y\le 10$, $x+4y\le 12$, $x+y\le 10$, $x\ge 0$, $y\ge 0$.

8. (a) Find the length of chord cut off from the line $2x+3y=13$ by the circle $x^2+y^2=26$.

(b) Find two vectors of length 2 parallel to the vector $\underline{v}=2\underline{i}-4\underline{j}+4\underline{k}$.

9. (a) Find the equation of ellipse with foci $\left(\pm 3\sqrt{3},0\right)$ and vertices $(\pm 6,0)$.

(b) If $\underline{a}+\underline{b}+\underline{c}=\underline{0}$, then prove that $\underline{a}\times\underline{b}=\underline{b}\times\underline{c}=\underline{c}\times\underline{a}$.

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Inter. (Part-II)-A- 2018

*Roll No.*_____*to be filled in by the candidate.*

(For all sessions)

Paper Code	8	1	9	5

Mathematics (Objective Type)

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1.1. Point of concurrency of medians of a triangle is called:

(A) orthocentre (B) in-centre (C) ex-centre (D) centroid

2. The lines represented by $ax^2+2hxy+by^2=0$, are real and coincident if:

(A) $h^2>ab$ (B) $h^2=ab$ (C) $h^2<ab$ (D) $h^2=a+b$

3. Equation of the line bisecting the first and third quadrant is:

(A) $y=x$ (B) $y=-x$ (C) $y=x+c$ (D) $xy=c$

4. Slope of the line which is perpendicular to the line $2x-4y+11=0$ is:

(A) $\frac{1}{2}$ (B) $-\frac{1}{2}$ (C) 2 (D) -2

5. Point (1 , 2), satisfies the inequality.

(A) $2x+y>5$ (B) $2x+y\geq 5$ (C) $2x+y<3$ (D) $2x+y<5$

6. The centre of the circle $(x+3)^2+(y-2)^2=16$, equals.

(A) $(3,-2)$ (B) $(-3,2)$ (C) $(3,2)$ (D) $(-3,-2)$

7. The eccentricity of $\frac{y^2}{4}-x^2=1$, equals.

(A) $\frac{2}{\sqrt{5}}$ (B) $\frac{-2}{\sqrt{5}}$ (C) $\frac{\sqrt{5}}{2}$ (D) $\frac{-\sqrt{5}}{2}$

8. $2i.(3j\times k)$ is equl to:

(A) 0 (B) 2 (C) 4 (D) 6

9. $\cos\theta$, equals to:

(A) $\hat{a}\,.\,\hat{b}$ (B) $|\vec{a}\times\vec{b}|$ (C) $\hat{a}\times\hat{b}$ (D) $\frac{|\vec{a}\times\vec{b}|}{|\vec{a}|}$

10. If $f(x)=\sqrt{x+4}$, then $f(x^2+4)$ is equal to:

(A) x^2-8 (B) $\sqrt{x^2-8}$ (C) $\sqrt{x^2+8}$ (D) x^2+8

11. $\lim_{x\to 0}\frac{\sin 7x}{x}$ is equal to:

(A) 1 (B) 7 (C) $\frac{1}{7}$ (D) 0

12. $\frac{d}{dx}\cos^2 x$ is equal to:

(A) $-\sin^2 x$ (B) $2\sin x$ (C) $2\sin x\cos x$ (D) $-2\cos x\sin x$

13. $1+x+\frac{x^2}{\lfloor 2}+\frac{x^3}{\lfloor 3}+\frac{x^4}{\lfloor 4}+\cdots\cdots$ is Maclaurin series of:

(A) e^x (B) $\sin x$ (C) $\cos x$ (D) $\ell n(1+x)$.

14. If $x=at^2$, $y=2at$, then $\frac{dy}{dx}$ is equal to:

(A) t (B) $\frac{1}{t}$ (C) t^2 (D) $\frac{1}{t^2}$

15. $\frac{d}{dx}\left(\frac{1}{ax+b}\right)$ is equal to:

(A) $ax+b$ (B) $\frac{-1}{(ax+b)^2}$ (C) $\frac{-a}{(ax+b)^2}$ (D) $\ell n(ax+b)$

16. If $y=\sin 3x$, then y_2 is equal to:

(A) $9\sin 3x$ (B) $-9\sin 3x$ (C) $9\cos 3x$ (D) $-9\cos 3x$

17. $\int_0^1\frac{1}{\sqrt{1-x^2}}dx$ is equal to:

(A) $\frac{\pi}{2}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{6}$

18. Solution of the differential equation $\frac{dy}{dx}=\cos x$, is:

(A) $y=\sin x+c$ (B) $y=-\sin x+c$ (C) $y=\cos x+c$ (D) $y=\ell n(\sin x)+c$

19. $\int e^{\tan x}\left(\sec^2 x\right)dx$ is equal to:

(A) $e^{\tan x}+c$ (B) $e^x.\tan x+c$ (C) $e^x.\sec x+c$ (D) $e^{\cot x}+c$

20. $\int_0^2\left(x^2+1\right)dx$ is equal to:

(A) $\frac{3}{10}$ (B) $\frac{14}{3}$ (C) $\frac{5}{3}$ (D) $\frac{8}{3}$

Roll No._____ to be filled in by the candidate.

(For all sessions)

Mathematics (Essay Type)

Time: 2:30 Hours

Marks: 80

Section -I

2. Write short answers of any eight parts from the following. 2x8=16

i. Prove the identity $\sec h^2 x = 1 - \tanh^2 x$.

ii. Find $f^{-1}(x)$ if $f(x) = 3x^3 + 7$.

iii. Evaluate $\lim_{x \to \pi} \frac{\sin x}{\pi - x}$.

iv. Differentiate w.r.t x, $y = \frac{2x-1}{\sqrt{x^2+1}}$.

v. Find $\frac{dy}{dx}$, if $xy + y^2 = 2$.

vi. Differentiate $\sin^2 x$ w.r.t $\cos^4 x$.

vii. Differentiate $\cos^{-1}\left(\frac{x}{a}\right)$ w.r.t x.

viii. Differentiate $(\ell nx)^x$ w.r.t x.

ix. Find $f'(x)$ if $f(x) = x^3 e^{\frac{1}{x}}$.

x. Find $\frac{dy}{dx}$, if $y = x\sqrt{\ell nx}$.

xi. Find y_2, if $y = \sqrt{x} + \frac{1}{\sqrt{x}}$

xii. Determine the interval in which function is increasing or decreasing

for the mentioned domain. $f(x) = \cos x : x \in \left(-\pi/2, \pi/2\right)$

3. Write short answers of any eight parts from the following. 2x8=16

i. Evaluate: $\int x\left(\sqrt{x}+1\right)dx$.

ii. Evaluate: $\int \frac{1-x^2}{1+x^2}dx$.

iii. Evaluate: $\int \frac{-2x}{4-x^2}dx$.

iv. Evaluate: $\int e^x\left(\frac{1}{x} + \ell nx\right)dx$.

v. Evaluate: $\int \frac{2x}{1-\sin x}dx$.

vi. Evaluate: $\int_{-1}^{1}\left(x^{\frac{1}{3}}+1\right)dx$.

vii. Define the definite integral.

viii. Solve the differential equation $ydx + xdy = 0$.

ix. Define the corner point.

x. Graph the solution set of linear inequality $2x + y \leq 6$.

xi. Find δy and dy in $y = x^2 + 2x$, when x changes from 2 to 1.8.

xii. Find the area between the $x-$axis and the curve $y = x^2 + 1$ from $x = 1$ to $x = 2$.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Find h such that $A(-1,h)$, $B(3,2)$ and $C(7,3)$ are collinear.

ii. Find the centroid of the triangle having vertices $(-2,3)$, $(-4,1)$ and $(3,5)$.

iii. Find an equation of the line through $(-5,-3)$ and $(9,-1)$.

iv. Find the lines represented by the homogeneous equation $3x^2+7xy+2y^2=0$.

v. Find measure of the angle between the lines represent by $x^2-xy-6y^2=0$.

vi. Find the equation of circle with centre $\left(\sqrt{2},-3\sqrt{3}\right)$ and radius $2\sqrt{2}$.

vii. Find the condition that the line $y=mx+c$ may touch the circle $x^2+y^2=a^2$.

viii. Derive equation of ellipse in standard form.

ix. Find centre and foci of the $x^2-y^2=9$.

x. Let $\underline{U}=\underline{i}+2\underline{j}-\underline{k}$ and $\underline{V}=3\underline{i}-2\underline{j}+2\underline{k}$ find $|\underline{U}+2\underline{V}|$.

xi. Find α, so that $|\alpha\underline{i}+(\alpha+1)\underline{j}+2k|=3$.

xii. Find a vector perpendicular to each of the vectors $\underline{a}=2\underline{i}+\underline{j}+\underline{k}$ and $\underline{b}=4\underline{i}+2\underline{j}-\underline{k}$.

xiii. Find the value of $2\underline{i}\times 2\underline{j}.\underline{k}$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Evaluate: $\lim\limits_{\theta\to 0}\dfrac{\tan\theta-\sin\theta}{\sin^3\theta}$.

(b) Show that $\dfrac{dy}{dx}=\dfrac{y}{x}$ if $\dfrac{y}{x}=\tan^{-1}\dfrac{x}{y}$.

6. (a) Evaluate: $\int\sqrt{x^2+4}dx$.

(b) Find the lines represented by equation. Also find measure of the angle between them. $2x^2+3xy-5y^2=0$.

7. (a) Evaluate: $\int_{1/8}^{1}\dfrac{\left(x^{1/3}+2\right)^2}{x^{2/3}}dx$.

(b) Minimize $z=3x+y$ subject to the constraints $3x+5y\geq 15$, $x+6y\geq 9$, $x\geq 0$, $y\geq 0$.

8. (a) Find an equation of parabola if focus is $(-3,1)$, directrix $y=1$.

(b) Use vectors to prove that the diagonals of a parallelogram bisect each other.

9. (a) Find the centre, foci, eccentricity, vertices and directrices of $9x^2+y^2=18$.

(b) Prove that $\sin(\alpha+\beta)=\sin\alpha\cos\beta+\cos\alpha\sin\beta$ by using vector method.

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Inter. (Part-II)-A- 2019

Roll No._____ to be filled in by the candidate.	**(For all sessions)**	Paper Code	8	1	9	5

Mathematics (Objective Type)

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. If a line "ℓ" intersect $x-axis$ at $(a,0)$, then "a" is called _____ of line "ℓ".

(A) y-intercept (B) $x-$intercept (C) slope (D) inclination

2. $y=mx+c$ is_____ form of equaion of line:

(A) point slope (B) intercept (C) normal (D) slope intercept

3. An equaion of line bisecting I and III quadrant is:

(A) $x=y$ (B) $x=-y$ (C) $x+2y=0$ (D) $x-2y=0$

4. $x=0$ is the solution of the inequality.

(A) $2x+1>0$ (B) $2x+1<0$ (C) $2x+1\leq 0$ (D) $2x-1<0$

5. The centre of circle $(x+1)^2+(y-2)^2=26$ is:

(A) (1 , 2) (B) (-1 , 2) (C) (-1 , -2) (D) (1 , -2)

6. The equation of directrix of the parabola $x^2=4ay$ is:

(A) $x=a$ (B) $x=-a$ (C) $y=-a$ (D) $y=a$

7. The centre of Ellipse $\frac{x^2}{4}+\frac{y^2}{1}=16$ is:

(A) (4 , 1) (B) (1 , 4) (C) (-1 , 4) (D) (0 , 0)

8. If $\underline{U}$ is any vector, then $\hat{U}=$

(A) $\frac{|\underline{U}|}{\underline{U}}$ (B) $\frac{\underline{U}}{|\underline{U}|}$ (C) $\frac{-\underline{U}}{|\underline{U}|}$ (D) $\underline{U}.|\underline{U}|$

9. If $2\underline{i}+\alpha\,\underline{j}+5\underline{k}$ and $3\underline{i}+\underline{j}+\alpha\,\underline{k}$ are perpendicular, then $\alpha=$

(A) 0 (B) 1 (C) -1 (D) 2

10. The domain of $g(x)=2x-5$ is:

(A) $\mathbb{R}$ (B) the set of positive No.

(C) The set of negative real No. (D) The set of non-negative real No.

11. $\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^{\frac{n}{2}}=$

(A) e (B) e^2 (C) $e^{\frac{1}{2}}$ (D) e^3

12. $\frac{d}{dx}(x-5)(3-x)=$

(A) $2x+8$ (B) $-2x+8$ (C) $2x-8$ (D) $x+8$

13. If $3x+4y+7=0$, then $\frac{dy}{dx}=$

(A) $\frac{3}{4}$ (B) $\frac{4}{3}$ (C) $\frac{-4}{3}$ (D) $\frac{-3}{4}$

14. $\frac{d}{dx}(\sec x)=$

(A) $\sec x\tan x$ (B) $\sec x$ (C) $\cos\sec x$ (D) $-\sec x\tan x$

15. If $f(x)=\sin x$, then $f'(0)=$

(A) 0 (B) 1 (C) -1 (D) 2

16. Differential of y is denoted by:

(A) dy' (B) $\frac{dy}{dx}$ (C) dy (D) dx

17. $\int\frac{1}{1+x^2}e^{\tan^{-1}x}dx=$

(A) $e^{\sec x}+c$ (B) $e^{\tan x}+c$ (C) $e^{-\tan x}+c$ (D) $e^{\tan^{-1}x}+c$

18. $\int_1^e \ell nx\,dx=$

(A) -1 (B) 0 (C) 1 (D) e

19. The order of differential equation $\frac{d^2y}{dx^2}+\frac{dy}{dx}-3x=0$ is:

(A) 2 (B) 1 (C) 0 (D) 3

20. If a line "ℓ" is parallel to $x-axis$, then inclination=

(A) 90^0 (B) 0^0 (C) 30^0 (D) 45^0

Roll No._____ to be filled in by the candidate.

(For all sessions)

Mathematics (Essay Type)

Time: 2:30 Hours **Marks: 80**

Section -I

2. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate the limit $\lim_{x\to a}\frac{x^n-a^n}{x^m-a^m}$.

ii. Discuss the continuity of $f(x)=\frac{x^2-9}{x-3}$ if $x\neq 3$.

iii. Find $\frac{dy}{dx}$ if $x^2-4xy-5y=0$.

iv. Prove that $\frac{d}{dx}\cot^{-1}x=\frac{-1}{1+x^2}$.

v. Find $\frac{dy}{dx}$ if $y=(x+1)^x$.

vi. Find y_2 if $x^2+y^2=a^2$.

vii. Find $\frac{dy}{d\theta}$ if $y=(\sin 2\theta-\cos 3\theta)^2$.

viii. Differentiate $\sin^2 x$ w.r.t $\cos^4 x$.

ix. Find the Maclarin Series for $f(x)=\cos x$.

x. Find $f'(x)$ if $f(x)=\frac{\blacksquare^x}{e^x+1}$.

xi. Express Area "A" of a circle as a function of its circumference "C".

xii. Determine the intervals for which $f(x)$ is decreasing and increasing $f(x)=\cos x; x\in\left(\frac{-\pi}{2},\frac{\pi}{2}\right)$.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate: $\int\left(\sqrt{x}+\frac{1}{\sqrt{x}}\right)\,dx\ ,(x>0)$.

ii. Evaluate: $\int\sqrt{1-\cos 2x}\,dx\ ,(1-\cos 2x>0)$.

iii. Evaluate: $\int(\ell nx)\times\frac{1}{x}\,dx\ ,(x>0)$.

iv. Evaluate: $\int x\sin x\cos x\,dx$ by parts.

v. Evaluate: $\int\tan^3 x\sec x\,dx$.

vi. Evaluate: $\int\frac{e^{m\tan^{-1}x}}{(1+x^2)}\,dx$.

vii. Define corner point or vertex.

viii. Define feasible region.

ix. Evaluate: $\int_{-1}^{3}(x^3+3x^2)dx$.

x. Evaluate: $\int_{1}^{2}\frac{x}{x^2+2}dx$.

xi. Find δy and dy of the function defined as $f(x)=x^2$, when $x=2$ and $dx=0.01$.

xii. Use differentials to approximate the value of $\sqrt[4]{17}$.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Find the points trisecting the join of A(-1,4) and B(6,2).

ii. Define inclination and slope of a line.

iii. Derive slope-intercept form of equation of straight line.

iv. Find the area of the triangular region whose vertices are A(5,3) B(-2,2) C(4,2).

v. Find equations of lines represented by $20x^2+17xy-24y^2=0$.

vi. Find focus and directrix of the parabola $x^2=-16y$.

vii. Write an equaion of parabola with focus (2,5) and directrix $y=1$.

viii. Find an equation of ellipse having centre (0,0) focus (0,-3) vertex(0,4).

ix. Find centre and foci of the ellipse $x^2+4y^2=16$.

x. Find unit vector in the direction of vector $\overline{v}=\frac{1}{2}\hat{i}+\frac{\sqrt{3}}{2}\hat{j}$.

xi. Define position vector.

xii. Find a vector whose magnitude is 2 and parallel to $-\hat{i}+\hat{j}+\hat{k}$.

xiii. Write vector triple product and scalar triple product.

Section -II

Note: Attempt any three questions from the following. 10x3=30

5. (a) Prove that : $\lim_{x\to 0}\frac{a^x-1}{x}=\log_e a$.

(b) Show that $\frac{dy}{dx}=\frac{y}{x}$ if $\frac{y}{x}=\tan^{-1}\frac{x}{y}$.

6. (a) Evaluate the integral: $\int e^x\left(\frac{1+\sin x}{1+\cos x}\right)dx$.

(b) Find k so that the line joining the points A(7,3) , B(k,-6) and the line joining the points C(-4,5), D(-6,4) are perpendicular.

7. (a) Find the area bounded by the curve $y=x(x-1)(x+1)$ and the $x-$axis

(b) Find the corner points of the feasible region intersected by the lines:

$2x+y\le 8\ ;\ x\ge 0$
$x+2y\le 14\ ;\ y\ge 0$

8. (a) Find equations of the circle of radius 2 and tangent to the line $x-y-4=0$ at A(1,-3).

(b) Prove that the line segment joining the mid points of two sides of a triangle is parallel to the third side and half as long.

9. (a) Find Eccentricity foci and directrices of hyperbola $4x^2-8x-y^2-2y-1=0$.

(b) Find moment about A(1,1,1) of resultant of the concurrent forces $i-2j$, $3i+2j-k$, $5j+2k$ where P(2,0,1) is their point of concurrency.

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Inter (Part-II) -A-2021

Roll No._____ to be filled in by the candidate.	**(For all sessions)**	Paper Code	8	1	9	1

Mathematics (Objective Type)

Time: 30 Minutes **Marks:20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. If $g(x)=\frac{1}{x^2}, x\neq 0$ then $gog(x)$ equals.

(A) x (B) x^2 (C) x^4 (D) x^3

2 $\lim_{\theta\to 0}\frac{1-\cos\theta}{\theta}$ equals.

(A) zero (B) 1 (C) 2 (D) 3

3. The derivative of $\sqrt{x}$ at $x=1$ is:

(A) $\frac{1}{2}$ (B) 2 (C) 1 (D) $\frac{-1}{2}$

4 $\frac{d}{dx}\left[\frac{1}{g(x)}\right]$ equals.

(A) $\frac{1}{g^2(x)}$ (B) $\frac{-g'(x)}{(g(x))^2}$ (C) $-g(x)$ (D) $\frac{1}{g(x)}$

5. If $y=5e^x$ then y_3 equals.

(A) $25e^x$ (B) $75e^x$ (C) $15e^x$ (D) $5e^x$

6. If $f(x+h)=\cos(x+h)$ then $f'(x)$ equals.

(A) $\cos x$ (B) $-\cos x$ (C) $-\sin x$ (D) $\sin x$

7. Inverse of $\int\ldots\ldots dx$ is:

(A) $\frac{d}{dy}$ (B) $\frac{d}{dx}$ (C) $\frac{dy}{dx}$ (D) $\frac{dx}{dy}$

8. $\int_a^b f(x)\,dx$ equals:

(A) $\int_b^a f(x)\,dx$ (B) $\int_b^a f(x)\,dx$ (C) $\int_b^{-a} f(x)\,dx$ (D) $\int_a^{-b} f(x)\,dx$

9. The general solution of $\frac{dy}{dx}=\frac{-y}{x}$ is:

(A) $xy=c$ (B) $x^2y^2=c$ (C) $\frac{x}{y}=c$ (D) $\frac{y}{x}=c$

10. $\int e^{-x}(\cos x - \sin x)dx$ equals:

(A) $-e^{x}\sin x + c$ (B) $e^{x}\cos x + c$ (C) $e^{x} + c$ (D) $e^{x}\sin x + c$

11. The distance of point (3,7) from x-axis is:

(A) 3 (B) 7 (C) -3 (D) -7

12. Slope of Y-axis is:

(A) zero (B) 1 (C) 2 (D) undefined

13. Equation of horizontal line through (7,-9) is:

(A) $y = -9$ (B) $y = 7$ (C) $x = -9$ (D) $x = 7$

14. (0,2) is solution of inequality.

(A) $3x + 5y > 7$ (B) $3x + 5y < 7$ (C) $x < 0$ (D) $x > 0$

15. Centre of circle $x^2 + y^2 + 2gx + 2fy + c = 0$ is:

(A) (g, f) (B) $(-g, f)$ (C) $(0,0)$ (D) $(-g, -f)$

16. Equation of Latus rectum of parabola $x^2 = 4ay$ is:

(A) $y = -a$ (B) $y = a$ (C) $x = -a$ (D) $x = a$

17. Vertices of $\frac{x^2}{16} - \frac{y^2}{25} = 1$ are:

(A) $(0, \pm 4)$ (B) $(0, \pm 5)$ (C) $(\pm 4, 0)$ (D) $(\pm 5, 0)$

18. The non zero vectors $\underline{a}$ and $\underline{b}$ are parallel if $\underline{a} \times \underline{b}$ is:

(A) zero (B) 1 (C) 2 (D) 3

19. $\cos\theta$ equals:

(A) $\underline{a}.\underline{b}$ (B) $\underline{a} \times \underline{b}$ (C) $|\underline{a} \times \underline{b}|$ (D) $\hat{a}.\hat{b}$

20. If any two vectors of scalar triple product are equal then its value is:

(A) -1 (B) zero (C) 1 (D) 2

Roll No. _____ *to be filled in by the candidate.*

(For all sessions)

Mathematics (Essay Type)

Time: 2:30 Hours **Marks: 80**

Section -I

2. Write short answers of any eight parts from the following. **2x8=16**

i. If $f(x)=x^2-x$, find (a). $f(-2)$ (b). $f(x-1)$

ii. Find $\lim_{x\to 2}\frac{x^3-8}{x^2+x-6}$

iii. Find $\lim_{\theta\to 0}\frac{1-\cos\theta}{\sin\theta}$.

iv. Differentiate w.r.t "x" $\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)^2$.

v. Find $\frac{dy}{dx}$ if $3x+4y+7=0$.

vi. Differentiate w.r.t "x" $\cos\sqrt{x}+\sqrt{\sin x}$.

vii. Differentiate w.r.t "x" $\cot^{-1}\left(\frac{x}{a}\right)$.

viii. If $y=\log_{10}\left(ax^2+bx+c\right)$, then find $\frac{dy}{dx}$

ix. If $y=x^2.e^x$, then find $\frac{d^2y}{dx^2}$

x. Apply Maclauren series, Prove that $\cos x=1-\frac{x^2}{2!}+\frac{x^4}{4!}+$ _____ ∞

xi. If $f(x)=\sqrt{x+1}$ and $g(x)=\frac{1}{x^2}$, then find (a). $(fog)(x)$ (b). $(gof)(x)$

xii. Find the intervals in which $f(x)$ is increasing or decreasing $f(x)=\cos x,\ x\in\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Using differential find $\frac{dy}{dx}$, if $x^2+2y^2=16$.

ii. Evaluate $\int x\sqrt{x^2-1}\,dx$.

iii. Evaluate $\int\frac{\left(1-\sqrt{x}\right)^2}{\sqrt{x}}\,dx$.

iv. Evaluate $\int\sin^2 x\,dx$.

v. Evaluate $\int\frac{ax+b}{ax^2+2bx+c}\,dx$.

vi. Evaluate $\int e^{3x}\left(\frac{3\sin x-\cos x}{\sin^2 x}\right)dx$.

vii. Sove $\frac{dy}{dx}=\frac{y^2+1}{e^x}$.

viii. Find an equation of the vertical line through (-5,3).

ix. Find an equation of the line through (-5,-3),(9,-1)

x. Convert $4x+7y-2=0$ in normal form

xi. Find the area below the curve $y=3\sqrt{x}$ and above the x-axis between $x=1$ and $x=4$.

xii. Find the mid point of the line segment joining the points A(3,1) , B(-2,-4).

4. Write short answers of any nine parts from the following. **2x9=18**

i. Graph the solution set by shading of inequality $5x-4y\le 20$.

ii. Find equation of circle with centre at $\left(\sqrt{2},-3\sqrt{3}\right)$ and radius $2\sqrt{2}$.

iii. Write equation of tangent to the circle $3x^2+3y^2+5x-13y+2=0$ at $\left(1,\frac{10}{3}\right)$.

iv. Find vertex of $x^2-4x-8y+4=0$.

v. Find point of intersection of conics $3x^2-4y^2=12$ and $3y^2-2x^2=7$.

vi. Find equation of parabola whose focus is F(-3,4) and directrix is $3x-4y+5=0$.

vii. Find the unit vector in the same direction of vector $\underline{V}=[3,-4]$.

viii. If $\overrightarrow{AB}=\overrightarrow{CD}$ find the co-ordinate of the point A when points B,C,D are (1,2)(-2,5) and (4,11) respectively

ix. Find $|3\underline{v}+\underline{w}|$ if $\underline{u}=\underline{i}+2\underline{j}-\underline{k}$, $\underline{v}=3\underline{i}-2\underline{j}+2\underline{k}$, $\underline{w}=5\underline{i}-\underline{j}+3\underline{k}$.

x. Find a vector of length 5 in the direction opposite that of $\underline{v}=\underline{i}-2\underline{j}+3\underline{k}$.

xi. Compute $\underline{b}\times\underline{a}$ if $\underline{b}=\underline{i}-\underline{j}+\underline{k}$, $\underline{a}=2\underline{i}+\underline{j}-\underline{k}$.

xii. Find the work done if the point at which the constant force $\overrightarrow{F}=4\underline{i}+3\underline{j}+5\underline{k}$ is applied to an object, moves from $p_1(3,1,-2)$ to $p_2(2,4,6)$.

xiii. If $\underline{a}+\underline{b}+\underline{c}=0$ then prove that $\underline{a}\times\underline{b}=\underline{b}\times\underline{c}=\underline{c}\times\underline{a}$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) If $f(x)=\begin{cases}3x-1 & if \quad x<1\\ 4 & if \quad x=1\\ 2x & if \quad x>1\end{cases}$, then show $f(x)$ is continuous at $x=1$.

(b) If $x=\dfrac{a(1-t^2)}{1+t^2}$, $y=\dfrac{2bt}{1+t^2}$, then find $\dfrac{dy}{dx}$.

6. (a) Find the approximate increase in the volume of a cube of the length of its each edge changes from 5 to 5 02.

(b) Determine the value of P such that the lines $2x-3y-1=0, 3x-y-5=0$ and $3x+py+8=0$ meet at a point.

7. (a) Evaluate $\int_2^3\left(x-\dfrac{1}{x}\right)^2 dx$.

(b) Minimize $z=2x+y$ subject to the constraints $x+y\geq 3$, $7x+5y\leq 35$, $x\geq 0$, $y\geq 0$.

8. (a) Write equations of two tangents from (2,3) to the circle $x^2+y^2=9$.

(b) Prove by vector method $\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta$.

9. (a) Show that $\cos(x+h)=\cos x-h\sin x-\dfrac{h^2}{2!}\cos x+\dfrac{h^3}{3!}\sin x+.....$

(b) Show that an equatin of the parabola with focus at $(a\cos\alpha, a\sin\alpha)$ and

directrix $x\cos\alpha+y\sin\alpha+a=0$ is $(x\sin\alpha-y\cos\alpha)^2=4a(x\cos\alpha+y\sin\alpha)$.

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Roll No. _____ to be filled in by the candidate.

Inter. (Part-II)-A-2022

Mathematics (Objective Type)

(For all Sessions)

Paper Code | 8 | 1 | 9 | 8 |

Time: 30 Minutes **Marks: 20**

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two more circles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank.

1.1. Slope of $12x + 35y - 7 = 0$ is _____
(A) $12/35$ (B) $-12/35$ (C) $1/35$ (D) 12

2. Normal form of $x + y = 1$ is _____
(A) $x\cos\frac{\pi}{3} + y\sin\frac{\pi}{3} = \frac{1}{\sqrt{2}}$ (B) $x\cos\frac{\pi}{2} + y\sin\frac{\pi}{2} = 1$
(C) $x\cos\frac{\pi}{4} + y\sin\frac{\pi}{4} = \frac{1}{\sqrt{2}}$ (D) $x + y = 2$

3. If $P(x, y) = 40x + 50y$ then $P(1, -1) =$ _____
(A) 10 (B) 40 (C) 50 (D) −10

4. Centre of $5x2 + 5y2 + 24x + 36y + 10 = 0$ is _____
(A) (−12, −18) (B) $\left(\frac{-12}{5}, \frac{-18}{5}\right)$ (C) (12, 18) (D) (−12, 18)

5. Axis of $y2 = -4ax$ is _____
(A) $y = 0$ (B) $y = a$ (C) $x = 0$ (D) $x = a$

6. Vertices of $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is _____
(A) $(\pm b, 0)$ (B) (a, b) (C) $(\pm a, 0)$ (D) $(-a, -b)$

7. Scalar triple product of coplaner vectors is _____
(A) 1 (B) 0 (C) 2 (D) −1

8. $2\hat{i} \times 2\hat{j} \cdot 2\hat{k}$ = _____
(A) 4 (B) 2 (C) 8 (D) 16

9. Which one is even function
(A) sin x (B) cos x (C) tan x (D) x^{101}

10. If $f(x) = \sqrt{x^2 - 9}$; then range of f(x) is _____
(A) $(0, -\infty)$ (B) $(-\infty, \infty)$ (C) (−5, 5) (D) $(0, +\infty)$

11. $\frac{d}{dx} 2^x =$ _____
(A) $2^x \ln 2$ (B) $2^x \ln e$ (C) $2^x \ln 4$ (D) $x\, 2^{x-1}$

12. Leibniz used _____ notation for derivative.
(A) $f'(x)$ (B) $f''(x)$ (C) D f(x) (D) $\frac{dy}{dx}$

13. $\frac{d}{dx}(\text{cosec } 7x) =$ _____
(A) cosec 7x cot 7x (B) − cosec x cot x (C) − 7cosec 7x cot 7x (D) cosec 7x tan 7x

14. Which one is decreasing function
(A) 2 − 4x (B) 4x − 2 (C) 4x (D) 4x + 5

15. d (xy) = _____
(A) xdx + ydy (B) (x + y)dx (C) xdy + ydx (D) xdy − ydx

16. $\int \sec x\, dx =$ _____
(A) $\ln|\sec x - \tan x| + c$ (B) $\ln|\sec x + \cot x| + c$
(C) $\ln|\sec x + \text{cosec } x| + c$ (D) $\ln|\sec x + \tan x| + c$

17. $\int_0^1 |x|\, dx =$ _____
(A) 1 (B) 2 (C) 0 (D) $1/2$

18. Solve $\frac{1}{y}dy = \frac{1}{x}dx$
(A) $y = xc$ (B) $y = -xc$ (C) $y = x^2 + c$ (D) $xy = c$

19. Distance between A(-1, 2) and C(2, -6) is
(A) $\sqrt{73}$ (B) $\sqrt{70}$ (C) 7 (D) 8

20. If $m_1 = m_2$ then lines are _____
(A) perpendicular (B) not parallel
(C) parallel (D) neither parallel nor perpendicular

Roll No. _____ to be filled in by the Candidate

Inter. (Part-II)-A-2022

MATHEMATICS (Essay Type) **(For All Sessions)**

Time: 2:30 Hours **SUBJECTIVE** **Marks: 80**

SECTION - I

2. Write short answers to any EIGHT questions: **(2 x 8 = 16)**

i- Search the domain and range from the real numbers of $g(x) = \sqrt{x^2 - 4}$

ii- The real valued functions f and g are defined below. Find (a) $f^2(x)$ (b) $g^2(x)$.

$$f(x) = \frac{1}{\sqrt{x-1}}; \quad x \neq 1, \quad g(x) = (x^2+1)^2$$

iii- Evaluate $\lim_{x \to \infty} \frac{5x^4 - 10x^2 + 1}{-3x^3 + 10x^2 + 50}$

iv- Evaluate $\lim_{\theta \to 0} \frac{\tan\theta - \sin\theta}{\sin^3\theta}$

v- Give any example and sketch graphically discontinuous function.

vi- Differentiate w.r. to 'x'; $\frac{(1+\sqrt{x})(x - x^{3/2})}{\sqrt{x}}$

vii- Find $\frac{dy}{dx}$ if $y = \sqrt{\frac{a^2+x^2}{a^2-x^2}}$

viii- Find the derivative w.r.t. variable involved $\cos\sqrt{x} + \sqrt{\sin x}$

ix- Find $f'(x)$ if $f(x) = \ell n(\sqrt{e^{3x} + e^{-2x}})$

x- Produce y_2 from $y = e^{ax} \sin bx$

xi- Determine the intervals in which f is increasing or decreasing:

$$f(x) = \cos x \qquad x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$$

xii- The perimeter of a triangle is 16 centimeters. If one side is of length 6 cm, what are lengths of the other sides for maximum area of the triangle?

3. Write short answers to any EIGHT questions: **(2 x 8 = 16)**

i- Use differential find $\frac{dy}{dx}$; $x^4 + y^2 = xy^2$

ii- Evaluate $\int \frac{e^{2x} + e^x}{e^x} dx$

iii- Evaluate $\int \sec x \, dx$

iv- Evaluate $\int \sin^{-1} x \, dx$

v- Evaluate $\int e^x \left(\frac{1}{x} + \ell n x\right) dx$

vi- Evaluate $\int \frac{5x + 8}{(x+3)(2x-1)} dx$

vii- Evaluate $\int_1^2 \frac{x}{x^2+2} dx$

viii- Find the area between the x-axis and the curve $y = \sin 2x$ from $x = 0$ to $x = \frac{\pi}{3}$

ix- Show that the points A (1, 2); B(7, 5) and C(2, -6) are vertices of a right triangle.

x- Find an equation of vertical line through (5, 3)

xi- Convert $15y - 8x + 3 = 0$ in slope-intercept form.

xii- Find the lines represented by ; $x^2 - 2xy \sec\alpha + y^2 = 0$

4. **Write short answers to any NINE questions:** **(2 x 9 = 18)**

i- Indicate the solution set of inequality $3x - 2y \geq 6$

ii- What is objective function?

iii- Write an equation of circle with centre at $(\sqrt{2}, -3\sqrt{3})$ and radius $2\sqrt{2}$

iv- Check the position of the point (5, 6) with respect to the circle $x^2 + y^2 = 81$

v- Find an equation of parabola with focus (–3, 1) and directrix $x = 3$

vi- Determine the equation of ellipse having foci $(\pm 3, 0)$ and minor axis of length 10.

vii- Calculate the eccentricity of $\frac{y^2}{16} - \frac{x^2}{49} = 1$

viii- Find an equation of the normal line to $y^2 = 4ax$ at $(at^2, 2at)$

ix- If O is origin and $\overline{OP} = \overline{AB}$, find the point P when A and B are (–3, 7) and (1, 0) Respectively

x- Write the direction cosines of $\underline{v} = 2\underline{i} + 3\underline{j} + 4\underline{k}$

xi- Prove that in any triangle ABC, $a^2 = b^2 + c^2 - 2bc \cos A$

xii- If $\underline{a} + \underline{b} + \underline{c} = 0$, then prove that $\underline{a} \times \underline{b} = \underline{b} \times \underline{c} = \underline{c} \times \underline{a}$

xiii- A force $\vec{F} = 3\underline{i} + 2\underline{j} - 4\underline{k}$ is applied at a point (1, 1, 2). Find the moment of $\vec{F}$ about the point (2, –1, 3)

SECTION – II

Note: Attempt any three questions from the following. **10 x 3 = 30**

5- (a) Show that $\lim_{x \to 0} \frac{a^x - 1}{x} = \log_e a$

(b) Show that $y = x^x$ has maximum value at $x = \frac{1}{e}$

6- (a) Integrate $\int \frac{4 + 7x}{(1+x)^2(2+3x)}\, dx$

(b) Find the point which is equidistant from the point A(5, 3), B(–2, 2) and C(4, 2). What is radius of circumcircle of triangle ABC.

7- (a) Find $\int_{\pi/6}^{\pi/2} \cos^2\theta \cot^2\theta\, d\theta$

(b) Minimize $Z = 2x + y$ subject to constraints $x + y \geq 3$, $7x + 5y \leq 35$, $x \geq 0$, $y \geq 0$

8- (a) Find the area of the triangular region. Whose vertices are A(5, 3), B(–2, 2), C(4, 2)

(b) Find the length of the chord cut off from the line $2x + 3y = 13$ by the circle $x^2 + y^2 = 26$

9- (a) Find equations of the common tangents to the two conics $\frac{x^2}{16} + \frac{y^2}{25} = 1$ and $\frac{x^2}{25} + \frac{y^2}{9} = 1$

(b) Use vectors, prove that the line segment joining the mid-points of two sides of a triangle is parallel to the third side and half as long.

HSSC-(P-II)-A/2023

Paper Code	8	1	9	1

Roll No [redacted] to be filled in by the candidate

(For All Sessions)

(Group-I)

Mathematics (Objective)

Lwp-12-1-23

Time: 30 Minutes Marks : 20

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

1.1 $\lim_{x \to 0} \frac{e^{2x} - 1}{x} = ?$ (A) 1 (B) 2 (C) 0 (D) -2

2. $\cos hx + \sin hx = ?$ (A) e^{x} (B) e^{-x} (C) e^{2x} (D) $2e^{x}$

3. $\frac{d}{dx}[\ln(2^{x})] = ?$ (A) $ln2$ (B) 2^{x} (C) $\frac{1}{2^{x}}$ (D) $\frac{ln2}{2^{x}}$

4. $\frac{d}{dx}(\cos hx) = ?$ (A) $-\sin hx$ (B) $\sin hx$ (C) $\operatorname{sech} x$ (D) $\operatorname{cosec} hx$

5. If $f(x) = \sqrt{x}$, then $f'(0) = ?$ (A) 0 (B) 1 (C) Undefined (D) $1/2$

6. $\frac{d}{dx}(\sin^{-1}x + \cos^{-1}x) = ?$ (A) 1 (B) 0 (C) -1 (D) 2

7. $\int 0\,dx = ?$ (A) x (B) $1/x$ (C) x^{2} (D) C

8. $\int e^{x}(x + \ldots)\,dx = ?$ (A) $xe^{x} + c$ (B) $e^{x} + c$ (C) $x + c$ (D) $x^{2} + c$

9. $\int_{0}^{\pi/2} \cos x\,dx = ?$ (A) 0 (B) -1 (C) 1 (D) 2

10. $\int \frac{\sin 2x}{\sin x}\,dx = ?$ (A) $2\cos x + c$ (B) $2\sin x + c$ (C) $\frac{1}{2}\sin x + c$ (D) $\frac{1}{2}\cos x + c$

11. The slope of a line $x = 5$ is: (A) 0 (B) 1 (C) -1 (D) Infinite

12. Midpoint of (0, -2) and (-2,0) is: (A) (0, 0) (B) $(-1, -1)$ (C) $(-2, -2)$ (D) $(0, -1)$

13. Distance between $(-1, 2)$ & (7, 5) is: (A) $\sqrt{73}$ (B) 7 (C) $2\sqrt{73}$ (D) 73

14. The solution of inequality $x + 2y < 6$ is: (A) (1, 4) (B) (1, 3) (C) (1, 1) (D) (1, 5)

15. Equation of Tangent to $x^{2} + y^{2} = 4$ at (2, 0) is: (A) $x = 1$ (B) $y = 1$ (C) $y = 2$ (D) $x = 2$

16. Slope of tangent to parabola $y^{2} = 4ax$ at $(a, 2a)$ is: (A) 2 (B) -1 (C) 1 (D) 3

17 Eccentricity e of a circle is: (A) $e = 0$ (B) $e = 1$ (C) $0 < e < 1$ (D) $e > 1$

18 Radius of a circle $x^{2} + y^{2} = 2$ is: (A) 2 (B) 1 (C) $1/2$ (D) $\sqrt{2}$

19. If $P = (2, 3), Q = (6, -2)$, then $|\overrightarrow{PQ}|$ is (A) $\sqrt{40}$ (B) $\sqrt{42}$ (C) $\sqrt{41}$ (D) $\sqrt{43}$

20. For a vector $\vec{v} = 2\hat{i} + 3\hat{j} - 6\hat{k}$, then $\cos\beta = ?$ (A) $\frac{3}{7}$ (B) $\frac{2}{7}$ (C) $-\frac{6}{7}$ (D) $-\frac{3}{7}$

to be filled in by the candidate

HSSC-(P-II)-A/2023

Marks : 80

hematics (Subjective)

(For All Sessions)
(GROUP-I)

Time: 2:30 hours

Rwp-12-1-23

SECTION-I

2. Write short answers of any eight parts from the following: (8x2=16)

i. Express perimeter P of a square as a function of its area A.

ii. Evaluate $\lim_{x\to 0} \frac{\sin x^0}{x}$

iii. Define even function with example.

iv. If $y = x^4 + 2x^2 + 2$, prove that $\frac{dy}{dx} = 4x\sqrt{y-1}$

v. Find derivative by definition $\frac{1}{\sqrt{x}}$

vi. Find $\frac{dy}{dx}$; $xy + y^2 = 2$

vii. Differentiate w.r.t x, $y = x^2 sec4x$

viii. Differentiate w.r.t x, $y = cot^{-1}\left(\frac{x}{a}\right)$

ix. Find $\frac{dy}{dx}$ if $y = x\sqrt{lnx}$

x. Apply the Maclaurin series to prove that: $e^{2x} = 1 + 2x + \frac{4x^2}{2!} + \frac{8x^3}{3!} + \cdots$

xi. Graph the solution set of $2x + y \leq 6$.

xii. Define feasible region.

3. Write short answers of any eight parts from the following: (8x2=16)

i. Evaluate $\int tan^2 x dx$.

ii. Evaluate $\int \frac{(a-b)x}{(x-a)(x-b)} dx$

iii. Evaluate $\int x\, sinx dx$.

iv. Evaluate $\int_{\pi/6}^{\pi/3} cost\, dt$

v. Solve the differential equation $y\,dx + x\,dy = 0$

vi. Evaluate $\int \frac{x^2}{4+x^2} dx$

vii. Find the areas between the $x-axis$ and the curve $y = x^2 + 1$ from $x = 1$ to $x = 2$

viii. Find a unit vector in the direction of $\underline{V} = \frac{1}{2}\underline{i} + \frac{\sqrt{3}}{2}\underline{j}$

ix. Find direction cosines of $\underline{V} = 4\underline{i} - 5\underline{j}$

x. Find $\propto$, so that vector $\underline{u} = 2\propto \underline{i} + \underline{j} - \underline{k}$, $\underline{v} = \underline{i} + \propto \underline{j} + 4\underline{k}$ are perpendicular.

xi. Find the area of parallelogram whose vertices are: $A(0,0,0)$ $B(1,2,3)$ $C(2,-1,1)$ $D(3,1,4)$

xii. A force $\vec{F} = 7\underline{i} + 4j - 3\underline{k}$ is applied at $p(1,-2,3)$. Find its amount about the point $Q(2,1,1)$

4. Write short answers of any nine parts from the following: (9x2=18)

i. Is $(\sqrt{176}, 7)$ at a distance of 15 units from the origin?

ii. By means of slopes, show that the print $(-4,6)$, $(3,8)$, $(10,10)$ lie on the same line.

iii. Find K so that the line joining $A(7,3)$; $B(k,-6)$ and the line joining $C(-4,5)$, $D(-6,4)$ *are parallel.*

iv. Find the equation of the lins having $y - intercept - 7$ and $slope - 5$.

v. Find the point of intersection of the lines $x - 2y + 1 = 0$ and $2x - y + 2 = 0$

vi. Find equation of lines represented by $2x^2 + 3xy - 5y^2 = 0$

vii. Find the measure of the angle between the lines represented by $9x^2 + 24xy + 16y^2 = 0$

viii. Find an equation of the circle with ends of diameter at $(-3, 2)$ and $(5, -6)$

ix. Show that the line $2x + 3y - 13 = 0$ is tangent to the circle $x^2 + y^2 + 6x - 4y = 0$

x. Check the position of the point $(5,6)$ with respect to the circle $x^2 + y^2 = 81$.

xi. Find focus and directrix of the parabola $x^2 = -16y$

xii. Find an equation of ellipse if foci $(-3\sqrt{3}, 0)$ and vertices $(\pm 6, 0)$.

xiii. Find equation of hyperbola with given data foci $(0, \pm 9)$, directrices $y = \pm 4$

SECTION-II

Note: Attempt any three questions. Each question carries equal marks: (10x3=30)

5. (a) Evaluate: $\lim_{x\to 0} \frac{Secx - Cosx}{x}$

(b) If $y = \tan(2\, tan^{-1}\frac{x}{2})$, then show that $\frac{dy}{dx} = 4\left(\frac{1+y^2}{4+x^2}\right)$

6. (a) Evaluate: $\int \frac{dx}{\frac{1}{2}Sinx + \frac{\sqrt{3}}{2}Cosx}$

(b) Find equation of line through intersection of $x + 2y + 3 = 0$, $3x + 4y + 7 = 0$ and making equal intercepts on the axes.

7. (a) Find the area bounded by the curve $f(x) = x^3 - 2x^2 + 1$ and $x - axis$ in the 1st quadrant.

(b) Minimize $Z = 3x + y$ subject to the constraints $3x + 5y \geq 15$ $x + 6y \geq 9$ $x \geq 0$, $y \geq 0$

8. (a) If $y = a\cos(lnx) + b\, sin(lnx)$ prove that $x^2\frac{d2y}{dx^2} + x\frac{dy}{dx} + y = 0$

(b) Find the coordinates of the points of intersection of the line $2x + y = 5$ and the circle $x^2 + y^2 + 2x - 9 = 0$, also find the length of intercepted chord.

9.(a) Find the centre foci , accentricity and vertices of the ellipse
$x^2 + 16x + 4y^2 - 16y + 76 = 0$

HSSC-(P-II)-A/2023

Paper Code	8	1	9	6

Roll No [redacted] to be filled in by the candidate

Mathematics (Objective)

(For All Sessions)

(Group-II)

Time: 30 Minutes Marks : 20

Rwp-12-2-23

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

1.1 Midpoint of $A(1,2)$ & $B(3,8)$ is (A) $(2,5)$ (B) $(4,10)$ (C) $(2,6)$ (D) $(2,8)$

2. $(1,-3)$ is in the solution of (A) $x+y \geq 1$ (B) $x+y \leq 0$ (C) $x+y=0$ (D) $x-y=0$

3. Centre of circle $x^2+y^2-6x+4y+13=0$ (A) $(3,2)$ (B) $(-3,2)$ (C) $(3,-2)$ (D) $(-3,-2)$

4. Focus of parabola $x^2=4ay$ is: (A) $(-a,o)$ (B) $(o,-a)$ (C) (a,o) (D) (o,a)

5. Eccentricity e for hyperbola is: (A) $e=1$ (B) $e=0$ (C) $e<1$ (D) $e>0$

6. Length of major axis of $\frac{x^2}{9}+\frac{y^2}{4}=1$ (A) 03 (B) 06 (C) 02 (D) 04

7. Which one is not scalar quantity. (A) Work (B) Time (C) Magnetic field (D) Speed

8. $[\underline{k}\ \underline{i}\ \underline{j}]$ (A) 2 (B) 0 (C) 1 (D) -1

9. $\lim_{x\to 2}\sqrt{x^3+1}-\sqrt{x^2+5}$ (A) -1 (B) 0 (C) 2 (D) -2

10. Area of circle of unit radius is: (A) π (B) 2π (C) π^2 (D) $2\pi^2$

11. $\frac{d}{dx}(3^x)=$ (A) $3^x lnx$ (B) $3^x ln2$ (C) $3^x ln3$ (D) $x\,3^{x-1}$

12. Lagrange used ____ notation for derivative. (A) $D\,f(x)$ (B) $f'(x)$ (C) $\frac{d}{dx}f(x)$ (D) $\dot{f}(x)$

13. $\frac{d}{dx}\cos 7x =$ (A) $7\sin 7x$ (B) $-7\sin 7x$ (C) $7\cos 7x$ (D) $-7\cos 7x$

14. Minimum value of function $f(x)=x^2+2x-3$ is at $x=$ (A) -3 (B) -2 (C) 0 (D) -1

15. $\int \frac{1}{1+x^2}dx =$ (A) $\sin^{-1}x+c$ (B) $\cos^{-1}x+c$ (C) $\tan^{-1}x+c$ (D) $\cot^{-1}x+c$

16. $\int \frac{1}{x^2}dx =$ (A) $-\frac{1}{x}+c$ (B) $\frac{1}{x}+c$ (C) $\frac{2}{x}+c$ (D) $\frac{-2}{x}+c$

17. Solution of $\frac{dy}{dx}=1$ is (A) $y=x^2+c$ (B) $y=e^x+c$ (C) $y=\ln x+c$ (D) $y=x+c$

18. $\int_0^1 3x^2dx =$ (A) 3 (B) 1 (C) 2 (D) 0

19. Equation of line through origin with slope 2: (A) $2x-y=0$ (B) $2x+y=0$ (C) $x+2y=0$ (D) $x-2y=0$

20. Slope of line parallel to y-axis: (A) -1 (B) 0 (C) ∞ (D) 1

to be filled in by the candidate

HSSC-(P-II)-A/2023

Marks : 60

ematics (Subjective) (For All Sessions) (GROUP-II)

Time: 2:30 hours

SECTION-I

Lwp-12-2-23

2. **Write short answers of any eight parts from the following:** (8x2=16)

i. Express perimeter P of a square as a function of its area A.

ii. If $f(x) = (-x + 9)^3$, find $f^{-1}(x)$

iii. Find $\lim_{x\to 0} \frac{1-Cos2x}{x^2}$

iv. Differentiate w.r.t "x" $(\sqrt{x} - \frac{1}{\sqrt{x}})^2$

v. If $y = \sqrt{x + \sqrt{x}}$ find $\frac{dy}{dx}$

vi. Find $\frac{dy}{dx}$ if $x = y\,Siny$

vii. Find $f'(x)$ if $f(x) = x^3.e^{1/x}$

viii If $y = x^2.\ln\left(\frac{1}{x}\right)$, find $\frac{dy}{dx}$

ix. If $y = Sin\,h^{-1}\left(\frac{x}{2}\right)$, Find $\frac{dy}{dx}$

x. Apply the Maclaurin series to prove that: $\sqrt{1+x} = 1 + \frac{x}{2} - \frac{x^2}{8} + \ldots\ldots$

xi. Graph the solution set of linear inequality in $xy - plane$, $2x + y \leq 6$

xii. What is a feasible solution?

3. **Write short answers of any eight parts from the following:** (8x2=16)

i. Using differentials find $\frac{dy}{dx}$ and $\frac{dx}{dy}$ for $x^2 + 2y^2 = 16$

ii. Evaluate: $\int \frac{(1-\sqrt{x})^2}{\sqrt{x}}\,dx$

iii. Evaluate: $\int \frac{x+2}{\sqrt{x+3}}\,dx$

iv. Evaluate: $\int tan^{-1}x\,dx$

v. Evaluate: $\int \frac{5x+8}{(x+3)(2x-1)}\,dx$

vi. Evaluate $\int_2^0 \frac{1}{(2x-1)^2}\,dx$

vii. Solve the differential equation $\frac{dy}{dx} = \frac{y^2+1}{e^{-x}}$

viii Find sum of $\overline{AB}$ and $\overline{CD}$ where $A(1,-1)$, $B(2,0)$, $C(-1,3)$ and $D(-2,2)$

ix. Find direction Cosines of vector $\underline{V} = 3\underline{i} - \underline{j} + 2\underline{k}$

x. Find $\propto$ so that $U = 2\propto \underline{i} + \underline{j} - \underline{k}$ and $\underline{V} = \underline{i} + \propto \underline{j} + 4\underline{k}$ and perpendicular.

xi. Compute $\underline{a} \times \underline{b}$ and $\underline{b} \times \underline{a}$ for $\underline{a} = \underline{i} + \underline{j}$, $\underline{b} = \underline{i} - \underline{j}$

xii. Find volume of parallelopiped determined by $\underline{U} = \underline{i} + 2\underline{j} - \underline{k}$, $\underline{V} = \underline{i} - 2\underline{j} + 3\underline{k}$ and $\underline{w} = \underline{i} - 7\underline{j} - 4\underline{k}$

4. **Write short answers of any nine parts from the following:** (9x2=18)

i. The point $C(-5, 3)$ is the center of the circle and $P(7, 2)$ lies on the circle. What is the radius of the circle.

ii. Show that the points $A(0, 2)$, $B(\sqrt{3}, -1)$ and $C(0, -2)$ are vertices of a right triangle.

iii. The points $P(-2, 6)$ and $O(-3, 2)$ are given in $xy - coordinate$ system. Find the $XY - Coordinte$ of P referred to the translated axes OX and OY.

iv. Find an equation of the line through $(-5, -3)$ and $(9, -1)$.

v. Convert $4x + 7y - 2 = 0$ in slope-intercept form.

vi. Find the lines represented by $3x^2 + 7xy + 2y^2 = 0$

vii. Find the point of intersection of the lines $3x + y + 12 = 0$ and $x + 2y - 1 = 0$

viii. Find center and radius of circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$

ix. Find focus and vertex of parabola $y^2 = -12x$

x. Find foci of an ellipse $9x^2 + y^2 = 18$

xi. Find eccentricity of hyperbola, $\frac{y^2}{4} - x^2 = 1$

xii. Write parametric equations of hyperbola.

xiii. Write down equation of tangent to the circle $x^2 + y^2 = 25$ at $(4, 3)$.

SECTION-II

Note Attempt any three questions. Each question carries equal marks: (10x3=30)

5. (a) Evaluate: $\lim_{x\to 0} \frac{Secx - Cosx}{x}$

(b) Find $\frac{dy}{dx}$ if $x\sqrt{1+y} + y\sqrt{1+x} = 0$

6. (a) Evaluate: $\int \frac{x}{x^4 + 2x^2 + 5}\,dx$

(b) Find equation of the line through $(5, -8)$ and perpendicular to the join of $A(-15, -8)$ and $B(10, 7)$.

7. (a) Solve the differential equation $\left(y - x\frac{dy}{dx}\right) = 2\left(y^2 + \frac{dy}{dx}\right)$

(b) Graph the feasible region of the following system of linear inequalities and find the corner points.
$2x + y \leq 10, x + 4y \leq 12, x + 2y \leq 10 \quad x \geq 0, y \geq 0$

8. (a) Show that $y = \frac{lnx}{x}$ has maximum value at $x = e$.

(b) Write an equation of the circle that passes through the given points $A(4, 5)$, $B(-4, -3)$, $C(8, -3)$

9. (a) Find the focus, vertex and directrix of the parabola $x^2 - 4x - 8y + 4 = 0$

RWP-1-24

☆☆☆	Roll No (To be filled in by the candidate)

HSSC (P-II)- A-2024

(For All Sessions)

(GROUP-I)

Paper Code	8	1	9	5

Mathematics (Objective)

Time: 30 Minutes **Marks : 20**

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

1.1	Midpoint of $A(2,0), B(0,2)$ is:	(A)	$(0,2)$	(B)	$(2,0)$	(C)	$(2,2)$	(D)	$(1,1)$
2.	The ___ point satisfies $x + 2y < 6$	(A)	$(4,1)$	(B)	$(3,1)$	(C)	$(1,3)$	(D)	$(1,4)$
3.	In a conic, the ratio of the distance from a fixed point to the distance from a fixed line is:	(A)	Focus	(B)	Vertex	(C)	Ecentricity	(D)	Centre
4.	Standard equation of Parabola is:	(A)	$y^2 = 4ax$	(B)	$x^2 + y^2 = a^2$	(C)	$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$	(D)	$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
5.	Equation of tangent to circle $x^2 + y^2 = a^2$ at $P(x_1, y_1)$ is:	(A)	$xx_1 + yy_1 = a^2$	(B)	$xx_1 - yy_1 = a^2$	(C)	$xy_1 + yx_1 = a^2$	(D)	$xy_1 - yx_1 = a^2$
6.	The volume of parallelopiped =____.	(A)	$(\underline{u} \times \underline{v}).\underline{\omega}$	(B)	$(\underline{u} \times \underline{v}) \times \underline{\omega}$	(C)	$\underline{u} \times (\underline{v} \times \underline{\omega})$	(D)	$\underline{u} \times (\underline{u} \times \underline{v})$
7.	The non-zero vectors are perpendicular when:	(A)	$\underline{u}.\underline{v} = 1$	(B)	$\lvert\underline{u}.\underline{v}\rvert = 1$	(C)	$\underline{u}.\underline{v} = 0$	(D)	$\underline{u}.\underline{v} \neq 0$
8.	$\underline{j} \times \underline{k} =$ _____.	(A)	$\underline{i}$	(B)	$-\underline{i}$	(C)	0	(D)	$\underline{k}$
9.	The range of $f(x) = 2 + \sqrt{x-1}$ is:	(A)	$[1, +\infty)$	(B)	$[2, +\infty)$	(C)	$(1, +\infty)$	(D)	$(2, +\infty)$
10.	The perimeter P of square as a function of its area A:	(A)	$3\sqrt{A}$	(B)	$4\sqrt{A}$	(C)	$\sqrt{A}$	(D)	$2\sqrt{A}$
11.	If $f(x) = \frac{1}{x^2}$ then $f(3) =$_____.	(A)	$\frac{1}{9}$	(B)	$\frac{-2}{3}$	(C)	$\frac{-2}{27}$	(D)	$\frac{1}{27}$
12.	If $f'(c) = 0$ & $f''(c) > 0$ then C is point of:	(A)	Maxima	(B)	Minima	(C)	Inflection	(D)	Constant
13.	$\frac{d}{dx}(\log_a x) =$ _____.	(A)	$\frac{1}{x \ln a}$	(B)	$\frac{\ln a}{x}$	(C)	$\frac{1}{x}$	(D)	$\frac{-1}{x \ln a}$
14.	$\frac{d}{dx}(\cot ax) =$ _____.	(A)	$\operatorname{cosec}^2 ax$	(B)	$a \operatorname{cosec}^2 ax$	(C)	$-a \operatorname{cosec}^2 ax$	(D)	$-a \operatorname{cosec} ax$
15.	$\int \frac{1}{\sqrt{1-x^2}}\, dx =$_____.	(A)	$Sin^{-1}x + c$	(B)	$Cos^{-1}x + c$	(C)	$-Sin^{-1}x + c$	(D)	$-Cos^{-1}x + c$
16.	$\int \frac{1}{x}\, dx =$_____.	(A)	$\ln x + c$	(B)	$\frac{1}{x^2} + c$	(C)	$-\frac{1}{x^2} + c$	(D)	$\frac{1}{x} + c$
17.	The solution of differential equation $\frac{dy}{dx} = -y$ is:	(A)	$y = xe^{-x}$	(B)	$y = ce^{-x}$	(C)	$y = e^x$	(D)	$y = ce^x$
18.	$\int_0^1 \frac{1}{1+x^2}\, dx =$ _____.	(A)	$\frac{\pi}{4}$	(B)	$\frac{2\pi}{3}$	(C)	$\frac{3\pi}{4}$	(D)	π
19.	x – intercept of the line $2x + 5y - 1 = 0$ is:	(A)	2	(B)	3	(C)	$\frac{1}{2}$	(D)	$\frac{1}{5}$
20.	Slope of $y - axis$ is:	(A)	0	(B)	1	(C)	-1	(D)	$Undefined$

RWP 1-24

Roll No _____ to be filled in by the candidate

HSSC-(P-II)-A/2024
(For All Sessions)
(GROUP-I)

Marks : 80

Time: 2:30 hours

Mathematics (Subjective)

SECTION-I

2. Write short answers of any eight parts from the following: (8×2=16)

i. If $f(x) = 2x + 1$, then find $fof\ (x)$.

ii. Express the area A of a circle as a function of its circumference C.

iii. Evaluate $\lim_{h\to 0} \frac{\sqrt{x+h}-\sqrt{x}}{h}$

iv. Define continuous function.

v. Differentiate $\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2 w.r.t\ x$

vi. Find $\frac{dy}{dx}$ if $y^2 - xy - x^2 + 4 = 0$

vii. Differentiate $x^2 sec4x w.r.t\ x$

viii. Differentiate $sin^2 x w.r.t.\ cos^4 x$

ix. Find $\acute{f}(x)$ if $f\ (x) = e^x(1 + lnx)$

x. Find y_2 if $y = ln(x^2 - 9)$

xi. Prove that $ln(1 + x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \cdots$

xii. Determine the interval in which $f(x) = cosx$ is decreasing; $x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$.

3. Write short answers of any eight parts from the following: (8×2=16)

i. Solve the differential equation $sec^2 x\ tan\ y\ dx + sec^2 y \tan x\ dy = 0$

ii. Find the area between $x - axis$ and the curve $y = x^2 + 1$ from $x = 1$ to $x = 2$

iii. Evaluate: $\int_1^e x\ lnx\ dx$

iv. Evaluate the integral $\int \frac{-2x}{\sqrt{4-x^2}} dx$

v. Evaluate: $\int \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2 dx$

vi. Evaluate the integral $\int (a - 2x)^{3/2} dx$

vii. Find the approximate change in the volume of a cube if length of its each edge changes from 5 to 5.02.

viii. Show that the points $A(0, 2), B(\sqrt{3}, -1)$ and $C(0, -2)$ are vertices of a right triangle.

ix. Convert the equation of line $4x + 7y - 2 = 0$ into normal form.

x. Fine the angle from the line with slope $\frac{-7}{3}$ to the line with slope $\frac{5}{2}$.

xi. Find the pair of lines represented by $3x^2 + 7xy + 2y^2 = 0$.

xii. Find the point of intersection of lines $3x + y + 12 = 0$ and $x + 2y - 1 = 0$.

4. Write short answers of any nine parts from the following: (9x2=18)

i. Define feasible region.

ii. Graph the solution set of in-equality $3x + 7y \geq 21$.

iii. Find equation of circle with ends of diameter at $(-3, 2)$ and $(5, -6)$.

iv. Write down equation of tangent to the circle $x^2 + y^2 = 25$ at $(5\ cos\theta\ , 5\ sin\theta)$

v. Find focus and vertex of Parabola $x^2 = 4(y - 1)$

vi. Find equation of ellipse with data Foci $(\pm 3, 0)$ Minor axis of length 10.

vii. Find center of hyperbola $x^2 - y^2 + 8x - 2y - 10 = 0$

RWP-1-24

viii. Find equation of Normal to $y^2 = 4ax$ at $(at^2, 2at)$.

ix. Find the sum of vector $\overrightarrow{AB}$ and $\overrightarrow{CD}$ given four points $A(1,-1)B(2,0)C(-1,3)$ and $D(-2,2)$

x. Find $\propto$, so that $|\propto \underline{i} + (\propto +1)\underline{j} + 2\underline{k}|=3$

xii. If $\underline{v}$ is a vector for which $\underline{v}.\underline{i} = 0\underline{v}.\underline{j} = 0\underline{v}.\underline{k} = 0$, find $\underline{v}$

xii. Find the area of triangle determined by the points $P(0,0,0)$ $Q(2,3,2)$ and $R(-1,1,4)$

xiii. Find the value of $2\hat{\imath} \times 2\hat{\jmath}.\hat{k}$

SECTION-II

Note **Attempt any three questions. Each question carries equal marks:** (10x3=30)

5. (a) Find the values of m and n, so that given function f is continuous at$x = 3$ when (05)

$$f(x) = \begin{cases} mx, & if\ x < 3 \\ n, & if\ x = 3 \\ -2x + 9, & if\ x > 3 \end{cases}$$

(b) Find $\frac{dy}{dx}$, when $x = \frac{a(1-t^2)}{1+t^2}, y = \frac{2bt}{1+t^2}$ (05)

6. (a) If $y = (cos^{-1}x)^2$, prove that $(1-x^2)y_2 - xy_1 - 2 = 0$. (05)

(b) Evaluate the integral $\int e^x sinx\ cosx\ dx$. (05)

7. (a) Solve the differential equation $y - x\frac{dy}{dx} = 3\left(1 + x\frac{dy}{dx}\right)$. (05)

(b) Graph the feasible region and corner points of the inequalities (05)

$$2x + y \leq 10\,; \qquad x + 4y \leq 12; x + 2y \leq 10;$$

8. (a) Show that the circles: $x^2 + y^2 + 2x - 8 = 0$; $x^2 + y^2 - 6x + 6y - 46 = 0$ touch internally. (05)

(b) Using vector method, for any triangle ABC, prove that: $c^2 = a^2 + b^2 - 2ab\ cosC$. (05)

9. (a) Find the focus, vertex and directrix of the Parabola; $x^2 = 4(y-1)$ (05)

(b) Find the lines represented by $3x^2 + 7xy + 2y^2 = 0$ and also find measure of the angle between them. (05)

RWP-2-24

☆☆	Roll No 756172

HSSC-(P-II)- A-2024
(For All Sessions)

Paper Code	8	1	9	4

Mathematics (Objective)

(GROUP-II)

Time: 30 Minutes **Marks : 20**

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

1.1	If $r = 0$, the circle is called:	(A)	Unit circle	(B)	Circle	(C)	Ellipse	(D)	Point circle
2.	$[i \;\; i \;\; k] =$	(A)	i	(B)	$-i$	(C)	1	(D)	0
3.	If $\underline{u} = 2\underline{i} - \underline{j} + \underline{k}, \underline{v} = 4\underline{i} + 2\underline{j} - \underline{k}$ then $\underline{u} \times \underline{u} =$	(A)	u^2	(B)	0	(C)	1	(D)	2
4.	If $\underline{u}, \underline{v}$ are two non-zero vectors, then area of parallelogram =	(A)	$\lvert\underline{u} \times \underline{v}\rvert$	(B)	$\frac{1}{2}\lvert\underline{u} \times \underline{v}\rvert$	(C)	$\frac{1}{6}\lvert\underline{u} \times \underline{v}\rvert$	(D)	$\frac{1}{2}(\underline{u} \times \underline{v})$
5.	If k is any real number, $\lim_{x\to a}[kf(x)] =$	(A)	$\lim_{x\to a} f(x)$	(B)	$\lim_{x\to a} k$	(C)	$k \lim_{x\to a} f(x)$	(D)	$f(x)$
6.	If $(fx) = x + 3$ then: $lim_{x\to 3} f(x) =$	(A)	6	(B)	0	(C)	-3	(D)	3
7.	If $y = e^{f(x)}$ then $\frac{dy}{dx} =$	(A)	$e^{f(x)}$	(B)	$f(x)e^{f(x)}$	(C)	$f(x)e^{f(x)}$	(D)	$f(x)e^{f(x)}$
8.	Derivative of $x\sqrt{x^2+3}$ $w.r.t\, x$ is:	(A)	$\frac{2x^2+3}{\sqrt{x^2+3}}$	(B)	$\frac{3x}{2\sqrt{x^2+3}}$	(C)	$\frac{3x^2+3}{x\sqrt{x^2+3}}$	(D)	$\frac{3x^2+3}{2x\sqrt{x^2+3}}$
9	Derivative of $\tanh(x^2)$ is:	(A)	$2x\, sech^2 x$	(B)	$2\, sech^2 x^2$	(C)	$2x\, sech^2 x^2$	(D)	$sech^2 x^2$
10.	Derivative of "x" $w.r.t$ "x" is:	(A)	x^2	(B)	2	(C)	0	(B)	1
11.	In integration, substitution of $\sqrt{4-x^2}$ is:	(A)	$x = sin\theta$	(B)	$x = 2\, sin\theta$	(C)	$x = sin2\theta$	(D)	$x = 2\, cos\theta$
12.	$\int Tan\, x\, dx =$	(A)	$ln\, cos\, x + c$	(B)	$\frac{1}{ln\, cosx} + c$	(C)	$-ln\lvert\cos x\rvert + c$	(D)	$Sec^2 x + c$
13.	Solution of differential equation: $(e^x + e^{-x})\frac{dy}{dx} = e^x - e^{-x}$ is:	(A)	$-ln\,(e^x + e^{-x}) + c$	(B)	$ln\,(e^x - e^{-x}) + c$	(C)	$ln\,(e^x + e^{-x}) + c$	(D)	$\frac{(e^x + e^{-x})^2}{2}$
14.	$\int SinxCos\, x\, dx =$	(A)	$\frac{Sin^2 x}{2} + c$	(B)	$\frac{Cos^2 x}{2} + c$	(C)	$-Sin\, x + c$	(D)	$Cosx + c$
15.	The line: $ay + b = 0$ is	(A)	Parallel to y-axis	(B)	Parallel to x-axis	(C)	Passing through origin	(D)	Lies in Quad. I
16.	The slope of line joining the points $(-2,4)\,;\,(5,11)$ is:	(A)	1	(B)	-1	(C)	45°	(D)	$-45°$
17.	The location of the plane of the point $P(x,y)$ for which $y = 0$ at:	(A)	$Origin$	(B)	$y - axis$	(C)	$x - axis$	(D)	$Ist\ Quad$
18.	The maximum and minimum values occur at:	(A)	Corner point	(B)	Any point	(C)	Convex region	(D)	Corner points of feasible region
19.	The line intersect the circle at:	(A)	One point	(B)	Two points	(C)	Infinite points	(D)	More than two points
20.	Diameter of circle: $x^2 + y^2 = 16$ is:	(A)	8	(B)	4	(C)	16	(D)	32

Roll No _____ to be filled in by the candidate

HSSC-(P-II)-A/2024

(For All Sessions)

Marks : 80

Mathematics (Subjective)

(GROUP-II)

Time: 2:30 hours

SECTION-I

2. Write short answers of any eight parts from the following: (8x2=16)

i. Define even function with example.

ii. Find $fog(x)$ if $f(x) = 2x + 1, g(x) = \frac{3}{x-1}, x \neq 1.$

iii. Evaluate: $\lim_{x \to 2} \frac{\sqrt{x}-\sqrt{2}}{x-2}$.

iv. Prove that $Sinh2x = 2\,Sinhx\,Coshx.$

v. Find $\frac{dy}{dx}$ from first principles if $y = \frac{1}{\sqrt{x+a}}$.

vi. Differentiate $w.r.t\ x$; $\frac{(x^2+1)^2}{x^2-1}$.

vii. Find $\frac{dy}{dx}$ if $x^2 - 4xy - 5y = 0.$

viii. Differentiate w.r.t θ; $tan^3\theta\ sec^2\theta.$

ix. Find $\acute{f}(x)$ if $f(x) = x^3e^{1/x}.$

x. Find y_2 if $y = 2x^5 - 3x^4 + 4x^3 + x - 2.$

xi. Apply Maclaurin Series expansion to prove that:
$cosx = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \cdots$

xii. Find extreme values for $f(x) = 3x^2.$

3. Write short answers of any eight parts from the following: (8x2=16)

i. Evaluate $\int x\sqrt{x^2-1}\,dx$

ii. Use differentials to approximate the value of $(31)^{\frac{1}{5}}$

iii. Evaluate: $\int \frac{x}{\sqrt{4+x^2}}dx$

iv. Evaluate the integral $\int \frac{e^{m\tan^{-1}x}}{1+x^2}dx$

v. Evaluate: $\int_1^2 \frac{x}{x^2+2}dx$

vi. Find the area between $x - axis$ and the curve $y = 4x - x^2$

vii. Solve the differential equation $\frac{1}{x}\frac{dy}{dx} = \frac{1}{2}(1 + y^2)$

viii. The points $A(-5, -2)$ and $B(5, -4)$ are ends of a diameter of a circle. Find the centre and radius of circle.

ix. The coordinates of a point p are $(-6, 9)$. The axes are translated through the point $\acute{O}(-3, 2)$. Find the coordinates of p referred to the new axes.

x. Check whether the origin and the point $p(5, -8)$ lies on the same side or on the opposite sides of the line $3x + 7y + 15 = 0$

xi. By means of slopes, show that the following points lie on the same line $(-4, 6)$; $(3, 8)$; $(10, 10)$.

xii. Determine the value of p such that the lines $2x - 3y - 1 = 0$, $3x - y - 5 = 0$ and $3x + py + 8 = 0$ meet at a point.

4. Write short answers of any nine parts from the following: (9x2=18)

i. Graph the solution set of $3y - 4 \leq 0$ in $xy - plane.$

ii. Define convex region.

iii. Find an equation of circle of radius a and lying in the second quadrant tangent to both the axes.

iv. Find center and radius of circle $5x^2 + 5y^2 + 24x + 36y + 10 = 0.$

v. Write down equation of normal to the circle $x^2 + y^2 = 25$ at $(4, 3)$.

vi. Find vertex and directrix of the parabola $y^2 = -12x.$

vii. Find the point of intersection of conics $x^2 + y^2 = 8$ and $x^2 - y^2 = 1.$

viii. Find center and foci of hyperbola $\frac{y^2}{4} - x^2 = 1.$

ix. Find a vector of magnitude 4 and is parallel to $2\underline{i} - 3\underline{j} + 6\underline{k}.$

x. Find direction cosines of $\overrightarrow{PQ}$ where $P = (2, 1, 5)$ and $Q = (1, 3, 1).$

xi. Find volume of parallelopiped whose edges are $\underline{u} = \underline{i} - 2\underline{j} + 3\underline{k}, \underline{v} = 2\underline{i} - j - \underline{k}$ and $\underline{w} = \underline{j} + \underline{k}$

xii. Find the value of $[\underline{k}\ \ \underline{i}\ \ \underline{j}]$.

xiii. Find $\propto$ so that $\underline{u} = \propto \underline{i} + 2 \propto \underline{j} - \underline{k}$ and $\underline{v} = \underline{i} + \propto \underline{j} + 3\underline{k}$ are perpendicular.

SECTION-II

RWP-2-24

Note **Attempt any three questions. Each question carries equal marks:** (10x3=30)

5. (a) Evaluate: $\lim_{\theta \to o} \frac{tan\theta - sin\theta}{sin^3\theta}$

(b) Differentiate $cos\sqrt{x}$ from the first principle. (5+5)

6. (a) Show that $y = \frac{lnx}{x}$ has maximum value at $x = e$

(b) Evaluate: $\int x^3 \cos x \, dx$ (5+5)

7. (a) Evaluate: $\int_{\frac{\pi}{6}}^{\frac{\pi}{2}} \frac{cosx \, dx}{sinx \, (2 + sinx)} dx$

(b) Minimize $z = 2x + y$ subject to constraints (5+5)

$x + y \geq 3 \quad 7x + 5y \leq 35$

$x \geq 0 \quad y \geq 0$

8. (a) Find the coordinates of the points of intersection of the line $x + 2y = 6$ with the circle: $x^2 + y^2 - 2x - 2y - 39 = 0$ (5)

(b) If $\underline{a} = 4\underline{i} + 3\underline{j} + \underline{k}$ and $\underline{b} = 2\underline{i} - \underline{j} + 2\underline{k}$. Find a unit vector perpendicular to both $\underline{a}$ and $\underline{b}$. Also find the sine of the angle between them. (5)

9. (a) Find the focus, vertex and directrix of the Parabola $x + 8 - y^2 + 2y = 0$ (5)

(b) Find coordinates of the circumcenter of the triangle whose vertices are $A(-2, 3)$, $B(-4, 1)$ and $C(3, 5)$. (5)